

THE SONORAN QUARTERLY



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Wildflower Gardens Double in Size

A spectacular bouquet was planted for spring and summer visitors to the Garden this year, thanks to a donation from DBG Trustee Brad Endicott and his wife Birte.

Their \$5,000 gift has nearly doubled the Garden's display of desert wildflowers with the addition of 6,800 square feet in two new flower beds.

"Most people think of the desert as cactus and agaves, but we wanted to broaden that perception," said DBG Director Robert Breunig. "We wanted to show people the beauty of native wildflowers and refine our techniques of growing these plants, so the flower beds are for both demonstration and experimentation."

The Endicotts' gift bought bird protection, irrigation, fertilizer, equipment rental, and fencing for the new flower displays, said Judy Mielke, senior horticulturist who designed and installed the wildflower displays throughout the Garden, with the help of volunteers and staff members.

A seed-mix of 20 native or Southwestern species, including poppys, lupines, bluebells, penstemon, verbena and others, was planted last November in the large bed which is located just north of the parking lot outside the admissions booth.

The other new bed, seeded at the same time, is located just outside the gift shop, slightly to the west and north.



PHOTO BY DICK GEORGE

The Sonoran wildflower garden, which covers 21,000 square feet and is located across the north entry drive from the gift shop, has been upgraded as a part of this project also, Judy said. Rita Anthony, of Wild Seed of Tempe, donated seed for this bed.

Plants of penstemon, globe mallow, creosote, bursage, and brittlebush were planted in the new wildflower beds to provide a background of permanent growth.

The key element to the plantings is protection from birds, Judy said. In addition to the familiar black netting, she is using two other products to deter birds: A white, spunbond polyester blanket and a mulch blanket of decomposable plant fibers. She will evaluate their performance throughout the season.

Another important part of the project is irrigation, Judy said. Cesar Mazier, superintendent of horticulture, and his staff installed automatic sprinklers on timers in the new flower beds.

(Continued on page 2)



PHOTO BY MARY IRISH

By Robert Breunig,
Executive Director

"Papago Park should become a great nucleus for the cultivation of the love of nature."

—Forrest Shreve, Director,
the Carnegie Desert Laboratory
in Tucson, on the dedication
of the Desert Botanical Garden,
February 12, 1939

The great Sonoran Desert ecologist Forrest Shreve was among the first to recognize Papago Park as a natural-history center for the Salt River Valley. Papago Park, known as Papago Saguaro National Monument from 1914 to 1930, was then, and still remains, a spectacular desert park within Arizona's largest city. In the intervening years, cities have encircled the park; roads and other facilities have fragmented its delicate ecology.

Yet the park still has the potential to match Shreve's original vision. The fact that the Desert Botanical Garden and the Phoenix Zoo are neighbors within the park creates an opportunity to build a unique display of desert natural history with enormous educational impact for the public.

To that end, the boards of the Desert Botanical Garden, the Phoenix Zoo, and the Phoenix Parks, Recreation and Library Department have agreed to form a joint committee

which will study common problems and long-range planning issues. The chairmanship of the committee will rotate among the directors of the participating organizations.

Working together, these Papago Park entities can develop a comprehensive master plan. By integrating interpretative messages, trails and exhibits, these institutions can create a focal point for interpretation of the desert environment. A day-long experience at Papago Park can become a powerful course in desert ecology.

Coordinated exhibits about plants and animals at both institutions, or on connecting trails between them, and ecological restoration (to the extent now possible) of degraded parts of the park can transform Papago Park into a teaching laboratory devoted to the holistic interpretation of the natural world.

All of us look forward to working together to make Papago Park a magnet for the Phoenix area — and a place where future generations will continue to develop a "love of nature." 🌵

Wildflower Gardens cont.

The Sonoran wildflower bed, in which about fifty types of wildflower seeds native to the Sonoran Desert were sown, produced somewhat disappointingly last year, Judy said. Seeds did not germinate well and plants did not show much vigor. Soil tests in the past year have led her to conclude that the soil there is low in nutrients and was probably compacted.

With staff help, Judy moved two small mountains — sixty cubic yards — of steer manure to the area and mixed it with ammonium phosphate into the soil with a roto-tiller.

(Continued on page 3)

Wildflower Gardens cont.

She has added other improvements to the wildflower displays: New fencing in the form of a one-inch plastic mesh around the beds; irrigation in the dozen beds along the entryway drive; irrigation, fencing, fertilizer and bird netting throughout the core-garden beds.

Judy began planning and ordering supplies for the beds in August; labor on irrigation and soil improvement began in September; fencing went in in October, and the seeds were broadcast in November. ☘

New Publication for Members

With this issue the Desert Botanical Garden inaugurates a new publication for members, *The Sonoran Quarterly*. This publication combines the best features of the former *Saguaroland Bulletin* and *Agave* magazine. It is our intent to make this publication lively and informative, giving you, the member, an inside look into the work of the Desert Botanical Garden. Each issue will contain regular features: horticultural tips, profiles of plants and people, research notes, a family activity page, and informative articles on garden activities. We shall also recognize those whose contributions make the work of the Desert Botanical Garden possible.

The name reflects the Garden's commitment as nurturer, interpreter, and protector of its exquisitely beautiful and fragile home, the great Sonoran Desert.

We are also pleased to introduce a new editor, Carol Schatt, a long-time Garden volunteer. Her sharp eye and her love of language will help us to communicate with you better.

We welcome your comments. ☘

Lecture Scheduled on Mushrooms

The Desert Botanical Garden, with Friends of the Arizona State University Libraries, will host a lecture, "Mushrooms and Truffles of the Southwest," by Jack States on Wednesday, March 27, in Webster Auditorium. He is the author of the recently published *Mushrooms and Truffles of the Southwest*, the first such guide. It describes more than 150 species commonly found in this region.

Lectures will be presented at 3 and 7 p.m., and the author will autograph books before and after. Admission to the lecture is free for Garden members and ASU Libraries Friends. Advance registration is required by telephoning 941-1225.

A 5:30 p.m. buffet dinner, "Morsels & Mushrooms," will feature delectable mushroom and truffle dishes prepared by local chefs. Special coffee service has been donated by the Coffee Plantation.

Cost of the dinner, which will benefit both organizations, is \$25 for members and \$30 for non-members. Reservations are required as seating is limited to 60 persons, and may be made with Dr. Joyce Foster at the ASU Development Office, 965-5374. A 24-hour answering machine will accept messages; please be sure to leave a daytime phone number. ☘

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DBG Strategies for Conservation

By Robert Breunig, Executive Director

From their inception in the late Middle Ages botanical gardens have served the needs of the societies that have maintained them. In a disease-ridden Europe, gardens featured plants with medicinal value. During the "Age of Discovery," European nations sought plants with economic value. As the science of botany developed, gardens were established to collect and classify new material from all over the world. Since Victorian times gardens have been places of aesthetic enjoyment and horticultural testing.

Botanic gardens today, however, are focusing on the most serious botanical problem of all time — the rapid decimation of the botanical world itself. The spread of human culture threatens more plant species each year. Botanists suggest as many as 60,000 species may be lost in the next fifty years. According to the World Conservation Union (IUCN), 15,000 of these have known economic value to man. We may not only be losing the beauty and diversity of these plants but depriving future generations of their potential for healing or use as foods, fibers, or industrial products. In the United States, out of an estimated 25,000 plants in our national flora, 3,000 are considered at risk of extinction.

Botanical garden officials have become alert to the problem and the urgent need for coordinated action. The Botanic Garden Conservation Secretariat of the IUCN is implementing a global "Botanic Garden Conservation Strategy" to coordinate work to conserve threatened plants. Gardens are encouraged to improve their databases, establish seed banks, conduct



conservation-oriented field surveys, foster public education on conservation issues, promote habitat preservation, and to collect and preserve rare plants.

In the United States, the Center for Plant Conservation, a consortium of twenty botanical gardens and arboreta, coordinates a program designed to build a national conservation collection of at-risk plants.

Conservation at the Desert Botanical Garden

The Desert Botanical Garden was charged with the mission "to conserve" in its Articles of Incorporation. On our opening day in February 1939, Garden President Gertrude Webster stated that "the conservation of rare plants, now rapidly being destroyed" would be one of the three principal goals of the Garden. Over the years the Garden has collected and preserved many rare plants at risk in the wild.

Today the Desert Botanical Garden has a fully developed plant conservation program and is now emerging as a national leader in this domain among botanic gardens.

In-situ Conservation Strategies

The ultimate success of plant conservation consists of preserving plants where they belong — in the wild. To this end, the Desert Botanical Garden works with public land management agencies to enhance in-situ (or, in the place where they grow) conservation of plants. The Garden has a five-year cooperative agreement with the U. S. Forest Service to survey, monitor, and assist with the management of the endangered *Agave arizonica*, one of the rarest agaves in the United States. Garden botanist Wendy Hodgson surveys rare plant populations in central Arizona.

Dr. Gary Nabhan and Mexican colleagues have completed a comprehensive survey of



plants in the U.S.-Mexico borderlands region. This survey has identified 105 plants at risk in the bi-national Sonoran Desert region.

Long-term conservation requires a thorough understanding of the ecology of the deserts themselves. Basic ecological research projects being conducted by Garden Research Botanist Dr. Joe McAuliffe will provide insights into the requirements of desert plants.

As land management practices become more favorable to long-term conservation, rare species can be reintroduced into the wild through carefully designed programs. Garden Curator of the Living Collection Liz Ecker has done pioneering reintroduction trials with *Agave arizonica* and *Mammillaria thornberi*.

In time, large-scale projects will help restore and heal degraded Sonoran Desert habitats. Funded by a grant from the Noyes Foundation, Research Ecologist Dr. Laura Jackson is leading the first major experiment to promote natural restoration of abandoned desert agricultural lands.

Ex-situ Conservation Strategies

Some plants are so critically threatened in nature that back-up populations in botanical gardens are deemed desirable.

Working with the Center for Plant Conservation, the Garden maintains a collection of such plants from the deserts of the Southwest United States. From seeds or cuttings representing as many separate populations of each species as possible, new populations are grown out. A living population of each species can thus be

maintained ex-situ (away from its place) through time. If enough plants are grown out, specimens can be released to other botanic gardens and reintroduction considered.

Collections Surveys and Assessments

In addition to plants specifically collected for the Center for Plant Conservation, the Garden cares for other rare species. A recent survey of our aloe collection revealed several South African species that are at risk in their home habitat. A long-term care and propagation program has been designed for them. Conservation assessments are now underway for our two largest collections, the cacti and agaves, and will continue throughout the collection to ensure that these species remain in the Garden collection.

Conservation Education

No conservation program would be adequate without strong education to foster a greater public appreciation of desert plants and the need to protect desert habitats.

The education department of the Garden spreads the message of conservation through tours and classes, and on interpretative signage.

A new conservation trail/exhibit, now being designed, will illustrate the concept of habitat protection and the forces which endanger desert plants.

Using many strategies, the Desert Botanical Garden has become a leader in identifying and conserving the rare and endangered plant species of the Sonoran Desert. Our goal is very straight-forward — to leave the next generation a desert diversity equal to that which we have inherited. 🌵

CPC's Mission: To Save

The Desert Botanical Garden is a Noah's ark to 31 plant species designated as rare or endangered by a national network of botanical institutions.

This network of 20 botanical gardens and arboretums across the country is the Center for Plant Conservation (CPC), organized in 1985 as a response to the rapidly increasing losses of plant species in the natural world. The Desert Botanical Garden, along with the Arboretum at Flagstaff, were founding participants of the consortium.

The CPC's mission is to identify, research, and rescue plant species which have become rare or are in danger of extinction.

Under CPC guidelines, the Garden collects these plants by seeds and/or cuttings from as many separate populations as possible. This results in the highest genetic diversity obtainable. The seeds (and if possible, pollen) are stored in the Garden's frozen seed bank facility in the Fleischer Propagation Center. Once an adequate set of seeds is stored in the seed bank, a smaller set of seeds is usually used to germinate and grow out plants. The number of plants per species grown out varies from species to species although the CPC recommends a minimum of fifty plants be maintained for proper genetic variability. These plants receive careful daily monitoring to ensure their survival as a captive population.

Collecting and growing these plants will preserve their survival. In much the same way as zoos have saved endangered animal species, increased their populations, and re-established them in the wild, the CPC will eventually re-establish some plant species in the natural world or share them with other botanic gardens.

A few plants from the CPC collection are

on display in the core garden here, but most are located in the Garden's new Fleischer Propagation Center according to each species' environmental needs: in a greenhouse, under a shade enclosure, or in full sun. Seeds are kept in the frozen seed storage laboratory of the Fleischer center.

The DBG's geographic area of responsibility on behalf of the CPC consortium is an area of the Southwest which includes the Sonoran Desert, southern New Mexico, and West Texas.

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of extinction.

The CPC list of rare and endangered plants automatically includes, but is not limited to, those plants so listed by the federal government. Plants may be nominated to the CPC list by a branch of government, university, conservation group or botanist. Liz Ecker, curator of the Garden's living collection, has nominated 10 additional species.

Plants may be listed if one or more of these criteria apply:

- Survival of the plant species or population is critically endangered;
- Propagation of the plant will enhance its survival and management options through research towards re-introduction or re-establishment of the population in the wild;

- The plant is monotypic — it exists as only one genus or species;
- The plant has economic potential;
- The plant is not known in cultivation;
- The plant is not getting sufficient conservation attention or has no legal protection such as state law or the endangered species act.

Principal care-giver of the CPC plant collection here is parttime staffer Lynda Pritchett-Kozak, who earned ASU's new botany/horticulture degree in December.

Collecting and growing these plants will preserve their survival...in much the same way as zoos have saved endangered animal species, increased their populations, and re-established them in the wild.

The Garden's CPC collection also includes three rare and endangered species of cactus from a CPC member institution in Florida. They are here as "off-site backups." The DBG may choose to send off-site backup specimens to other member institutions when the number of specimens propagated here permits. ☘

Species in the Center for Plant Conservation Center collection at the Desert Botanical Garden, as plants or seeds, or both:

Agave arizonica
Agave parviflora
Agave schottii v. *treleasei*
Amoreuxia gonzalezii
Amsonia grandiflora
Amsonia kearneyana
Amsonia tharpai
Castilleja elongata
Cereus eriophorus v. *fragrans*
Cereus robinii
Coryphantha minima
Coryphantha ramillosa
Coryphantha robbinsorum
Echinocactus horizonthalonius v. *nicholli*
Echniocereus viridiflorus v. *davisii*
Echniomastus erectocentra v. *acunensis*
Echniomastus erectocentra v. *erectocentra*
Epithelantha bokei
Festuca ligulata
Genistidium dumosum
Helianthus niveus ssp. *tephrodes*
Macropodium supinus
Mammillaria thornberi
Opuntia spinosissima
Peniocereus greggi v. *transmontanus*
Pholisma sonora
Proboscidea sabulosa
Rhus kearneyi ssp. *kearneyi*
Toumeyia paprycantha
Tumamoca macdougallii
Zanthoxylum parvum

Fleischer Center Key to DBG Propagation

The Garden has bought a new ticket — a ticket for safe passage for its collection of plants into the middle of the 21st century.

That ticket is the Fleischer Propagation Center, named in honor of major donors to its construction, Donna and Morton Fleischer. Mrs. Fleischer, a horticulturist, served on the Board of Trustees from 1985 to 1990. Members of the Garden's Saguaro Society gathered in December to dedicate the facility.

As the DBG plant collection has matured, some species have been reduced to one or two plants and may no longer be available for collection from the wild. To keep these species represented in the collection, it becomes necessary to propagate them here at the Garden.

"This Center is the central facility the Garden requires in order to ensure there is something for the public to see in the future," said DBG Director Robert Breunig. "This makes it possible for the collection here to be just as diverse in the next fifty years." It is one of the improvements in recent years of which he is most proud.

The center includes several components: Two large greenhouses to contain plants needing sheltered environments and to house populations of rare and endangered species; a propagation-work building with more bench space for potting plants and a seed-storage laboratory; a large outdoor area for plants requiring full sun; and a shade building for plants needing filtered light.

The facility provides a clean environment for plant propagation, which greatly reduces chances of disease or insect damage. It is also designed for expansion for future needs.

This Center is the central facility the Garden requires in order to ensure there is something for the public to see in the future.

Building a new propagation center has had greater impact on the Garden than mere construction. "When you are building a new facility," the director said, "you go back and rethink your procedures, too." Curator of the Living Collection Liz Ecker is developing a new collections policy manual which will outline new horticultural procedures.

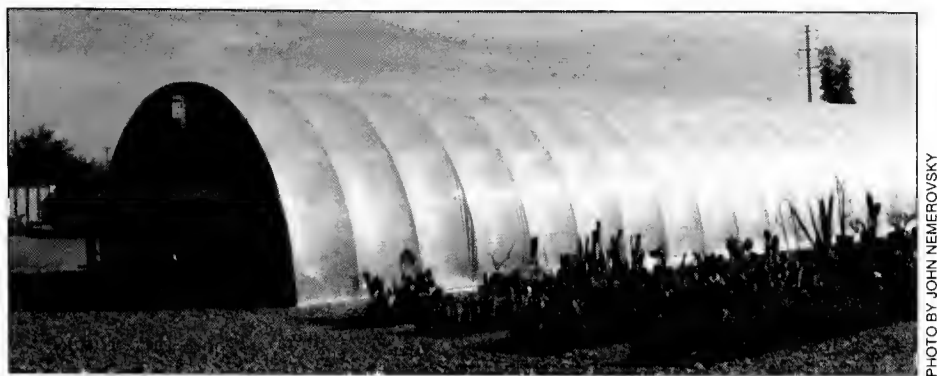
The facility was built with cost-effective considerations in mind. "First of all, it is not an



Interior of one of the new greenhouses.

ultra-fancy facility," the director said. In addition, the two greenhouses are actually recycled commercial greenhouses which were donated by Ron Gass of Mountain States Wholesale Nursery. To further trim costs, a combination of contractors and staff was used to build the center. And to produce the most practical facility possible, each member of the horticultural department helped plan the design and layout of the center.

The revised collections policy re-defines which deserts are represented in the DBG collection. It also will contain new guidelines and procedures to use in obtaining plants and maintaining the collection, and will serve as a tool to help Garden staff identify which plants most need back-up specimens.



Greenhouse is neighbor to large area for plants needing full sun.

"In building the Fleischer Center we take great pride in upgrading the whole facility," the Garden director said. "It will contribute enormously to the long-term work of the Garden. We are very grateful to the staff and Trustees who helped us and for their recognition of the central importance of this project." 🌱

DBG Computer Knows Where That Plant Is

Keeping track of the plants in the Garden's collection is a process which has grown as much as the Garden. With the informed leadership of Victor Gass, long-time staff member, and hours of work by volunteers and staff, the Garden's plant records have been transformed from a simple card catalog system in the 1970s to the computerized mapping system of today.

Because they hold living organisms, the collections have always been extremely dynamic. Plants are continually changing in physical appearance, may be moved to another location, or may be removed because they have died. A more systematic and thorough approach to mapping the Garden was needed in order to keep up with the changes.

The Garden mapping system started many years ago. The first maps of this project, drawn in 1977 and 1978, were primarily rough pencil sketches used for locating newly planted materials that needed extra watering.

In the next year rough maps of the propagation beds were drawn and in 1980 general mapping techniques were developed for the entire Garden collection. Large-scale maps of each individual bed were made between June

and December of 1981 and a 100-meter grid system was surveyed on the grounds.

Most beds were completely mapped by March of 1983 and although some of the larger outlying areas such as Barnes' Butte and the front entrance drive remained unmapped, compilation of the first "Garden Planting Atlas" into a single unit took place on March 18, 1983, six years after the project began.

By this time computerized record-keeping was underway at the Garden, and in late 1984 work began manually to cross-reference the database and map records. The process was slow and tedious; about one-third of the Garden was done by early 1986.

By now the Garden was growing fast; new gardens and trails were adding thousands of plants and the old bed maps were becoming outdated. With an Institute of Museum Services conservation grant to link the Garden's database with an automated mapping system at ASU (the Geographic Information System), the first official full-scale mapping inventory of the collections began.

Using surveying instruments provided by Bill Cartmell, DBG volunteer, and the local engineering firm of Coe & Van Loo Consulting Engineers, Inc., staff and dedicated volunteers have been mapping each plant in the Garden since October, 1989. The project is nearly complete.

Many volunteers have helped on this project: Bill Van Loo, Bill Cartmell, Ann Brown, Sandy Cielaszyk, Edra Drake, Jean Cordts, Linda Overby, Martha Wood, and Elaine Gruber. 🌱

Liz Ecker, Curator



PHOTO BY MARY IRISH

Liz Ecker says she switched careers from nursing to botany because "plants don't talk back."

She's only kidding: Plants say a lot to her. They've lured her from a career in nursing back to college for a Bachelor of Science degree in urban horticulture in 1988 and a Master of Science degree in botany in 1990. They've called to her until she now finds herself curator of the living collection at the DBG.

She began at the Garden as an intern in the Australian collection in January 1988, and that summer served as an intern for the Center for Plant Conservation (CPC) here. In the fall she became the CPC horticulturist while conducting research for her Master's degree on the rare cactus *Mammillaria thornberi*.

Her job as curator, which she assumed last September, gives her the overall responsibility for the Garden's plants. It is primarily managerial: She is in charge of the horticultural staff, the seed storage facility, and the plant records.

But she has to be a visionary, too, to see trends in the collection, to decide what to collect, what to propagate. A background in taxonomy as well as horticulture helps here, she said. And she also has "to make sure things we add fit our collections policy."

The collections policy, now undergoing revision, is that "we collect plants of the Sonoran Desert and deserts analogous to it from all over the world," Liz said. This includes rare, endangered and threatened species.

Historically, the Garden has emphasized cacti and agaves, and has a fine representation of them. However, only one or two specimens of some species remain. Frost, aging, pests, disease and other factors have taken their toll on species collected earlier in the Garden's history. Re-collecting is harder now than it was then, Liz said. "You don't just get in a truck and go down to Baja and get them. You need permits. Some plants are too rare to be collected. It can be done but it's much more complicated."

So, her job, "to maintain the collection in the best way," involves maintaining its diversity by re-collecting or propagating. She also will be preparing conservation plans for each rare taxa in the Garden "so that fifty years from now we won't be in the same boat." The first step in preparing these plans is to survey the collection "to see what is rare and what we need to start doing about it."

Conservation is the name of the game for a plant curator. "Part of our role in conservation is to preserve plants out of their environment," she said, "by growing them, learning about them, studying them, gathering information as to what makes them rare and then turning that information back to plant managers."

"Liz understands very well the Garden's mission of conservation," said Robert Breunig, DBG director. "She started out here as an intern

and has time and time again taken on challenges and demonstrated great leadership skills. She understands the issues important today." 🌱



Field Notes

Revegetation Study Underway

By Dr. Laura Jackson,
Research Ecologist

As the price of groundwater increases and its availability shrinks, more and more cropland will be retired in Arizona. What will happen to that land?

Ecologists can often predict what will happen in the future by looking at the past. Dr. Joe McAuliffe and I have been visiting some of the farmland abandoned between 1940 and 1989; we have found that sometimes fields don't "go back" to desert.

Vast areas of Arizona that once supported creosote, saltbush, night-blooming cereus, mesquite and tomatillo were leveled, tilled, and irrigated to produce cotton, wheat, and alfalfa. Once farming ceased, tumbleweed, desert broom, and burrowweed took over these fields. And, in many cases, twenty or even fifty years after the field last produced a crop, the weeds remain, along with the old crop furrows. We fear that farmland abandoned now will bear permanent scars — monotonous fields of weeds and bare, cracked soil where a diverse desert community once stood.

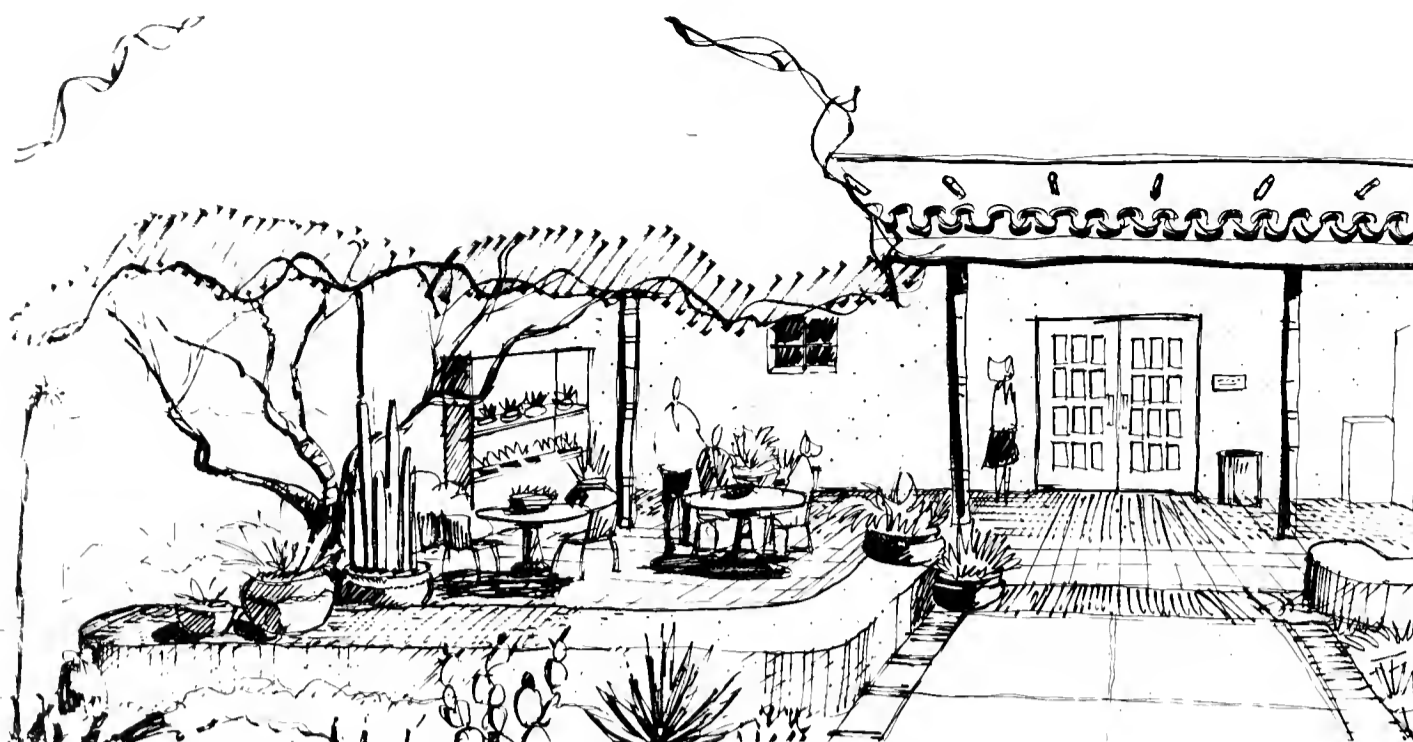
How big is the problem? What causes some old fields to look like weed patches or parking lots, while others heal successfully in the same amount of time? What techniques could be

used by farmers just before retiring the field, to encourage desert plants to come back once cultivation has stopped? Finally, how can we help restore thriving desert communities to the many agricultural areas that have already been abandoned — cheaply and without irrigation?

As part of the Garden's program, studies began this winter on a farm near Toltec Junction where crops were grown about fifty years ago. Large portions of the land and nearby fields are completely bare — nothing grows for hundreds of yards in any direction. The land is owned by TES Farms, who generously gave permission to work there.

An experiment was devised to plant native shrubs and test whether straw mulch, weeding, or nurse plants would help them successfully establish. We planted the experiment on January 3 with the help of Dan James, a revegetation specialist at Western Sod Inc., and who donated equipment (two four-wheel-drive tractors, a border disk, a ripper, and a straw crimper) and hay. The next day it rained — perfect timing! The seeds were in the ground and well-watered.

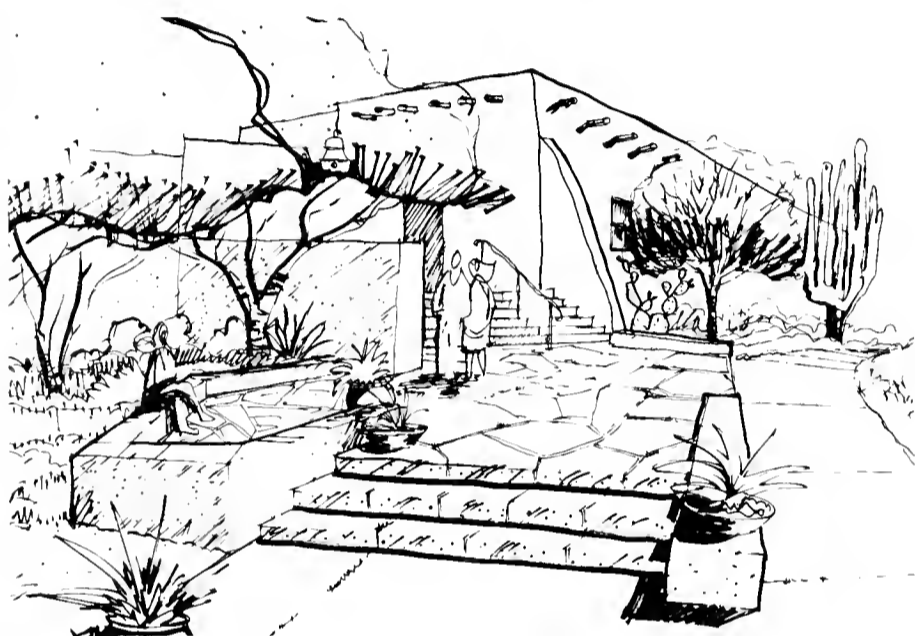
Wild Seed of Tempe donated creosote and saltbush seeds, and DBG volunteers put in about two hundred hours of work collecting the desert saltbush, tomatillo, and grass seeds that were planted. The study is expected to continue one or two years. 🌱



New patio on south side of gift shop.



Amphitheater where tours can



Larger patio outside Webster Auditorium.



New shade islands for rest stops.

On the Trail: A New Look, New Comforts

The Garden's paths will be getting a new look as a major trail-system renovation gets underway. Design work has been completed for the project, which will produce more attractive walkways and entrances and will greatly enhance visitor comfort.

Great care is being taken to place these improvements throughout the Garden with little impact on the plants growing there now.

IMPROVEMENTS:

New look to main entrance

Brick paving stones will extend from the admission-center entrance out 12 feet into the area that is now blacktop parking. Landscape plants and bright-colored banners will evoke a festive mood.

New Patios for the Gift Shop

New patios will be added to the north and south sides of the gift shop. The south patio

offers a spectacular panoramic desert view.

A Porch for the Restrooms

This addition to the restrooms east of Webster Auditorium will offer shade. Other improvements to the area will be bench seating, landscape lighting, and a new drinking fountain.

Webster Patio to Expand

The unique flagstone patio which partially surrounds Webster Auditorium will gain an additional 500 square feet. Highlighted by new landscape lighting, this area will be a pleasant gathering spot day or night.

Shade Islands

Nine shade islands will be constructed along the trails. Featuring rustic stone benches and a drinking fountain under the canopy of existing mature trees, these areas will offer welcome rest and a cool drink to Garden visitors. One shade island has been donated in memory of Robert R. Ferguson from Mary Doris Ferguson.

New Interpretive Areas

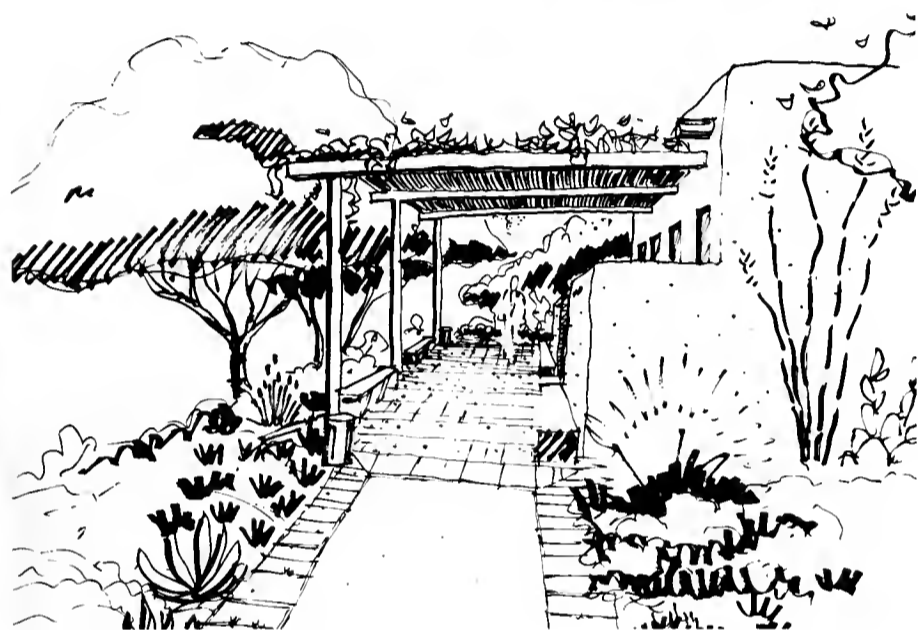
Seven demonstration areas are planned for



in.



Banners, plants, brick pavers at main entry.



New porch on public restrooms.

hands-on activities at touch carts or instructions from docents. These areas will resemble the shade islands.

New Entrance for Groups and an Amphitheater

A new, separate entrance for groups will decrease congestion at the main entrance, and an adjacent amphitheater will provide an area for tours to assemble. Lectures or performing arts presentations will be held in this quaint setting.

New Trail Surfaces and Path Lighting

A brick pave stone in natural colors will be used on the main trail circling the Garden core. Widened in places, it will feature pull-offs where visitors frequently take photographs. Interior paths will be covered with stabilized decomposed granite for a more natural and intimate look.

Trail lighting will be installed through the Garden enabling a summer schedule of evening hours, sure to be popular in the hot summer months.

The Board of Trustees will fund one-third of this project, and contributions are sought for the remainder. Large and small gifts, memorials, and tributary donations are all appropriate and grate-



Additional areas for touch-cart stations.

fully received. Areas may be named for a donor with contributions beginning at \$10,000. Please contact the Development Office or send your gift to: Trail Revisions, Desert Botanical Garden, 1201 N. Galvin Parkway, Phoenix, Arizona 85008.

OPPORTUNITIES TO HELP

Main Entrance	\$50,000
Gift Shop North & South Patios	\$15,000 each
Restroom Porch	\$15,000
Webster Patio	\$25,000
Shade Islands	\$10,000 each
Interpretive Demonstration Areas	\$10,000 each
Tour Entrance and Amphitheater	\$45,000
Trail Surface	\$100,000
Lighting	\$30,000

DesertFest Set for April 6-7

This spring the Garden is pleased to announce the continuation of the annual Cactus Festival and its new name, DesertFest. This event is scheduled April 6 and 7, from 9 a.m. to 5 p.m. throughout the Garden. Admission to all DesertFest events is free with admission to the Garden.

This event celebrates the Sonoran Desert and reaffirms our understanding and appreciation of this unique area. For children of all ages, the education department has arranged a full schedule of events, demonstrations and activities along the Plants and People of the Sonoran Desert Trail.

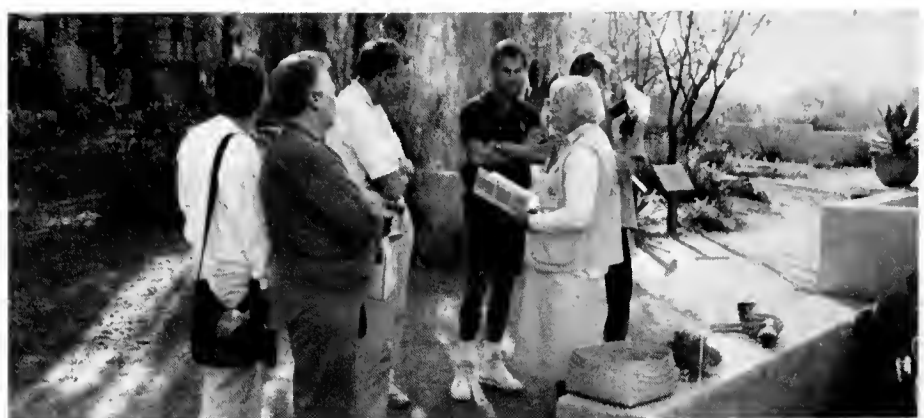
The horticulture department will be stationed throughout the core garden to explain principles of desert landscaping and demonstrate techniques of planting, pruning, plant selection, and other topics.

A variety of musical entertainment will be offered on Ullman Terrace from 11 a.m. throughout the afternoon. Francine Reed will perform Saturday from 5 to 7 p.m. Food from the Sonoran desert region will be available as well as more traditional fare.

Demonstrations will be held on both days at locations throughout the Garden on animals of the Sonoran Desert, and the many, varied uses of desert foods.

The Garden will hold its annual succulent sale from 9 a.m. to 5 p.m., at which unusual and difficult-to-obtain succulents will be offered for sale.

The Central Arizona Cactus and Succulent Society will hold their annual juried show during this weekend. Members of the Society will demonstrate how to care for succulents in containers, how to propagate and grow these plants, and how to prepare plants for exhibition.


PHOTO BY JOHN NEMEROVSKY

DesertFest is the culmination of the Garden's spring season. It marks for all desert dwellers the time of arrival and renewal. It is a season of celebration, a time for all desert inhabitants to remember and nurture the fragile system that sustains us. 🌵

Teen Volunteers Sought

For the third summer, the plant sales department will continue the teen volunteer program. Volunteers, aged 12 to 18, may apply to work in the sales program throughout the summer. The work is principally in propagation and care of plants to be sold during the season. Any interested teenager should apply through the education department. There are a limited number of openings, so early application would be appreciated. Work is done under the supervision of Mary Irish and the sales greenhouse volunteers.

Gift Shop

The gift shop has received some exciting new T-shirt designs, says Mary Ann Fox, manager. This might be what your summer wardrobe needs. Check it out! Gift shop hours are 9 a.m. to 5 p.m. every day of the week.

Tents and Cups Help Against Frost Damage

The aloe blossoms at the Garden outscored the killing frosts this year, with a little help from their friends in the horticulture department.

Cesar Mazier, superintendent of horticulture, and his staff along with Art Pizzo of maintenance improved frost-protection techniques on the days before predicted freezing weather and brought the aloes — and other tender plants — through this winter's cold snap successfully.



Effective frost protection brought aloe beds through winter to their best bloom display in years.

They erected plastic “tents” over the aloe beds, shaped the tent-tops to allow rainwater to run off, and put a heater in each bed to keep the aloes cozy through the freezing nights.

Most visitors to the Garden were able to figure out the plastic tents, but they did wonder about the styrofoam cups on the growth tips of



Styrofoam cups protected tender growth tips from frost damage.

many cactus species. This, too, was frost protection. And it worked, Cesar said. The cups were donated by the Scott Container Product Company, whose George Castelli, Vice President of Finance, saw an article in the paper and called the Garden to offer the cups.

In addition to using burlap on the tree aloes and heaters in various places throughout the Garden, Cesar experimented this year with a synthetic blanket as cover on plants within the core-garden. It was successful and he plans next year to cover frost-tender, winter-blooming trees such as the cascalote near Elliott Patio.

Cesar said it is advisable to cut out frost-damaged areas in cacti and agaves when damage becomes obvious, about two weeks after the frost. Otherwise, rot may set in at the damaged tissues and could spread to the rest of the plant. Frost damage can be detected by changes in the plant's color, or in its texture — it becomes soft and mushy. Damaged tissues also smell bad, he said.

“I am extremely pleased with our horticulturists' increased efforts toward frost protection,” said Robert Breunig, DBG Director. 🌵



PHOTO BY GARY IRISH

Rare Plant at Home in CPC Greenhouse

Epithelantha bokei
Button Cactus

Among the most charming of cacti, *Epithelantha bokei* is a tiny, globular cactus, each stem no more than three inches high and one-and-one-half inches across.

It is distinguished by having extremely small, tightly arranged spines arising from each tubercle. (In some cacti, particularly *Mammillaria*, the stems are not arranged in ribs, but in a series of projections resembling chocolate drops. These projections are called tubercles.) Because of the structure of the spines and the fact that they are white, the plant has a satiny appearance. When in bloom, delicate pink flowers arise from tiny depressions in the white domes of the plant. Fruits are slightly flattened and red, and are considered edible.

In nature these cacti typically occur on limestone hills and cliffs near the Rio Grande River. *Epithelantha bokei* has long been a favorite of collectors because of its exquisite form; ironically, this is the very pressure which has reduced the population of the species. The plant is listed by Texas on its Endangered Species List and is maintained at the Desert Botanical Garden under the Center for Plant Conservation program.

The Garden has had great success growing and producing seed from this plant. Plans for this species include studies of seed viability, particularly seeds which have been frozen. Many types of seeds are frozen for future use, and it is important to determine how long such seed will remain viable. Studies in germination techniques will also begin once enough seed is on hand. 🌵

A Native to Consider

Calliandra eriophylla

Fairy Duster, Powder Puff Tree, Mock Mesquite, Mesquitilla

This charming Arizona native is a small woody perennial which is among the most striking of desert plants. It grows to only 3 or 4 feet. Bloom begins in February in the lower elevations, with a profusion of delicate pink powderpuff balls. These balls are actually a tight collection of stamens extruding from the base of the flower, inviting the wind to distribute pollen.

The genus name *Calliandra* refers to beautiful stamens, while the epithet, *erriophylla*, means woolly leaves. Both are extremely apt.

A legume — that is, a plant in the family of beans, mesquite, and acacia — *Calliandra's* distinctive seed pod is velvety to the touch. Once the seeds are ripe, the pod dries out and splits along the seam. This splitting, or dehiscing, releases the seed.

This small shrub is common on dry, gravelly hillsides. It frequently occurs along arroyos and in desert canyons as well. Its natural distribution is from western Texas through the American Southwest to southeastern California and into northern Mexico. The plant grows from elevations as low as 2000 feet above sea level to 5000 feet.

The plant is extremely drought-tolerant and therefore can be used extensively in the most natural of landscapes. It also serves as excellent erosion control both in nature and in difficult, steeply sloped landscape sites. This combination of great beauty, extreme drought-tolerance, and ability to grow in very difficult situations makes it a highly desirable landscape plant. The shrub can tolerate vigorous pruning, and in fact is

considered a browse plant by both native animals and cattle. Heavy pruning encourages the plant to be more lush in appearance.



Calliandra eriophylla requires very well-drained, dry soil. Rocky soils present no problem to this plant, and are indeed even desirable. The plant is not known to be susceptible to any pests or diseases.

Fairy duster can be planted successfully in either spring or fall although fall plantings usually result in somewhat more success. The newly planted fairy duster needs to be regularly watered until established. Some supplemental irrigation should be offered for the entire first year in the ground.

A plant with many names, fairy duster is a beautiful small shrub which deserves more attention in the desert landscape. ☘



Calendar Notes

Lecture: "Mushrooms & Truffles of the Southwest"

March 27, 3 and 7 p.m.

Advance registration required

Dinner: "Mushrooms & Morsels"

March 27, 5:30 p.m.

Advance reservation required

Music in the Garden

Sundays through March 31, 10:30 a.m. - 1 p.m.

DesertFest

April 6-7, 9 a.m. - 5 p.m.

Throughout the Garden

Dinner on the Desert

April 27, cocktails at 6:30 p.m., dinner at 8 p.m.

Ullman Terrace

Annual Meeting

May 23, 5:30 p.m.

Webster Auditorium



Desert Gardener

18

Moving Saguaros

In the past saguaros have customarily been transplanted by placing them in holes deep enough (four or five feet) to keep them upright and have not been watered for fear of over-watering.

New techniques have been developed which promise much more success transplanting that regal sentinel of the desert, the saguaro (*Carnegiea gigantea*). They include planting the cactus no deeper than it originally grew, giving the transplant a monthly drink, and cabling the plant if support is necessary.

Superintendent of Horticulture Cesar Mazier can point to a dozen thriving saguaros he has transplanted in the Garden which are not staked, propped, nor planted deeper than they grew originally — and they stand resolutely, swaying only slightly when he or the wind pushes against them.

A saguaro's root system, Cesar explained, is shallow; a cactus twelve feet tall will have roots about 24 inches deep. The saguaro likes its roots close to the surface of the ground in order to take quick advantage of any rainfall and to hold itself in place. Planting the cactus several feet deeper requires the plant to push its roots further up towards the surface of the soil; this lengthens the time required to develop an effective new root system, and the cactus suffers dehydration during this period. It also extends the time required for the cactus to grab hold of the ground and support itself in the new location.

Cesar recommends digging a hole deeper than the existing root system on the saguaro to be transplanted and breaking up any caliche at the sides of the hole. Then the hole can be backfilled up to where the roots will sit. At that point, he says, you can put the cactus into the

hole and while supporting it carefully, center it. When you have centered the cactus correctly, it will be so balanced that it will stand in the hole without support! At this point you can fill in the rest of the hole. It may not need cabling.



He waters the plant after about two weeks, using a slow trickle two or three feet away from the base of the plant for about 24 hours, with monthly waterings thereafter.

You can tell when your saguaro needs water, Cesar says, by squeezing a rib between your thumb and forefinger. If the flesh is soft, the cactus needs a drink; if the flesh is hard, the plant has sufficient water stored.

Cesar recommends using support for cacti eight feet or taller.

After the cactus is planted it will settle a few inches in the hole. If it begins to lean following transplanting, you can saturate the ground with slow watering, push the cactus into position, and cable it.

An established saguaro which starts to lean may be doing so because its structure is collapsing on one side under the ground due to rot, dehydration, erosion, or an excess of water around the plant.

To support your transplanted saguaro, Cesar recommends using woven straps wrapped loosely around the cactus and cabled to three stakes at even intervals around the plant. Woven straps do not block air and light from the cactus, and thus minimize scarring. He used synthetic cord about 1/4" thick as cables on two saguaros he moved three months ago to the front of the gift shop.

How long to leave the cables on? The first two or three waterings will settle the soil around the plant. When the soil is completely hardened, the cables may be removed. This could be as soon as three months (if during the summer) or several months longer.

When you select your saguaro, Cesar suggests you look at the health of the plant before you consider its height. Does the "squeeze" test indicate it has stored enough water? Is the color good? Does it have injuries or infection?

Further information and an excellent informational sheet are available through the Garden's Plant Hotline, 941-1225, Monday through Friday, 1 to 2:30 p.m. 🌵

Additional tips on moving saguaros or other large cacti:

- Cacti move best in warm weather, but can be moved at any time provided water is adjusted to seasonal requirements.
- A saguaro larger than five feet tall will require special equipment and can be dangerous to move on your own.
- Before removing the cactus from the ground, wrap the plant with a blanket, carpet, worn-out garden hose, or any other device to help cushion the spines and enable you to carry it. A minimum amount of digging and prying will release the roots.
- Let the roots dry in a shady area for one or two weeks.
- When replanting the cactus, bury it to its original soil line, and orient the plant so that the side which faced south faces the same direction again.
- If necessary for support, wrap the plant with canvas or woven slings and cable it from three angles.
- Water the plant slowly and deeply with a hose about two feet away from the base of the cactus. Monthly watering will help it reestablish itself.
- Don't forget: Any cactus moved from its original location must be tagged in accordance with state law, and tags must remain with the plant for its entire life.

Dinner Promises Elegant Evening

Dinner on the Desert, a distinctive fund-raising event for the DBG, will be held Saturday, April 27, under a full moon on Ullman Terrace at the Garden.

A highlight of the evening will be the display of art plates created especially for this event by 18 nationally known artists. The hand-painted porcelain plates range in design from a whimsical chicken to stunning landscapes. They promise to become collectors' items, according to Lila Harnett, publisher of "Phoenix Home & Garden Magazine."

Contributing artists are Joe Baker, Joe Beeler, J. D. Challenger, Patrick Caffaro, Esmeralda DeLaney, Robert Haozous, David Johns, Michael Johns, Ed Mell, Merrill Mahaffey, Lowell Nesbitt, Dennis Numkena, Bill Owen, Howard Post, Amado Pena, Jaune Quick-To-See-Smith, Beth Ames Swartz, and Bill Tull.

The plates will be shown during cocktails at the Dinner on the Desert event. They will also be displayed at six art galleries before and after the Dinner event. At each showing accelerated bids will be accepted, and bidders will have the opportunity to increase their bid even if they cannot attend a subsequent showing.

Funds raised from the dinner and plate sale will support ongoing care and maintenance at the Garden. Chairing the event is Marilyn Papp; her co-chairman is Jean Harris. The evening will begin with cocktails at 6:30 p.m. throughout the Garden and dinner on the Terrace at 8 p.m. Strolling musicians will entertain. Tickets are \$150 per person or \$1,200 for a table of eight. Further information and reservations are available by calling the Garden at 941-1225. ☎

Art plates will be shown at these locations:

March 16:	Joy Tash Gallery 4234 N. Craftsman Court, Scottsdale 10 a.m. - 6 p.m.	April 4:	Feathers Gallery 7103 E. Main Street, Scottsdale 7 - 9 p.m.
March 17:	Joy Tash Gallery "Best-of-Scottsdale" Progressive Brunch 11 a.m. - 5 p.m.	April 5:	Feathers Gallery 10 a.m. - 6 p.m.
March 23:	Arizona Design Center "Phoenix Home & Garden" Interior Seminar 9 a.m. - 5 p.m.	April 11:	Circle Gallery 7051 E. 5th Ave., Scottsdale 7 - 9 p.m.
March 28:	Elaine Horwitch Gallery 4201 N. Marshall Way, Scottsdale 7 p.m. - 9 p.m.	April 27:	Dinner on the Desert Desert Botanical Garden cocktails, 6:30 p.m.; dinner, 8 p.m. Reservations required
March 29:	Elaine Horwitch Gallery 9:30 a.m. - 5 p.m.	May 2:	Stetter Gallery 2501 E. Camelback Rd., Phoenix 7 - 10 p.m.
March 30:	Elaine Horwitch Gallery 9:30 a.m. - 2 p.m.	May 3:	Stetter Gallery 10 a.m. - 10 p.m.

"Desert Detectives" Get New Case

The following pages have been designed for use by children and their families. This new section will follow the idea of the "Desert Detective" game which is given free of charge to all children who visit the Desert Botanical Garden. Children and their families enjoy playing the mystery game while learning about the plants and animals who make the Garden their home.

Sammy Saguaro "Super Sleuth" and his detective agency (children and families) will be given a new desert discovery assignment in each issue of *The Sonoran Quarterly*. Member families are invited to visit the Garden where they will discover many of the clues they need to solve these desert mysteries. ☎

Desert Detective

CASE NUMBER TWO

"The Case of the Surprising Spring"
(A Self-Guiding Tour for Children)

The Desert Detective Agency invites you to solve Sammy Saguaro's second desert mystery. You have been assigned to "The Case of the Surprising Spring." The Agency has given you clues to help you learn about the plants and animals that live in the Desert Botanical Garden. The clues will also help you solve the puzzle. Good luck on your search!



**Sammy Saguaro,
the "Super Sleuth"**

DIRECTIONS

1. Be sure to stay on the paths while looking for the answers to your puzzle.
2. Put a *mark* on each clue box as you discover an example of the clue. As you discover more examples of a clue, add more marks in your clue box.
3. To find out what kind of detective you are, count the total number of marks in all your clue boxes.

Desert plants often have small leaves. Small leaves lose less water than big leaves. This helps the plant to save water.



Clue: Find a leaf smaller than the one shown above.



4. What kind of DETECTIVE are you?
5-10 marks = Desert Detective
11-15 marks = Agave Ace
16-20 marks = Cactus Captain
21+ marks = Super Saguaro Sleuth

----- CUT HERE -----

DESERT DETECTIVE CERTIFICATE: CASE NUMBER 2

name

visited the Desert Botanical Garden on

Date

and earned the title of

Type of Detective

The desert puts on its party colors in the spring. Wildflowers come in all colors of the rainbow.



Clue: Find a wildflower with at least three colors on it.

Some bees rely on the pollen in cactus flowers that bloom in the spring. Cactus flowers that attract bees are brightly colored and open wide to provide a "landing pad" for bees.



Clue: Find a bee or other insect visiting a cactus flower.

Green flower buds can be seen on many cactus plants in the spring. These flower buds will open into large, showy flowers.



Clue: Find a cactus with large green flower buds.

Hummingbirds sip nectar from red or orange flowers which are shaped like tubes. There are many of these flowers blooming during the spring.



Clue: Find a hummingbird visiting a flower.

Prickly-pear cacti grow new pads in the spring. These new pads are smaller and greener than the older pads.



Clue: Find a prickly-pear cactus with at least two new pads.

Birds are very busy building nests for their babies in the spring. They use twigs, fine grass, leaves, feathers, spider webs, and cottony plant fibers.



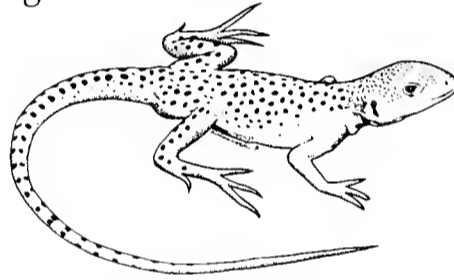
Clue: Find a bird's nest or a bird building a nest.

There are flowers on plants of all different sizes. Some flowers are very close to the ground and some are on the tallest plants.



Clue: Find a flower blooming lower than your knees or twice as high as you are.

Many lizards live among the plants in the Garden where they find food and shelter. They are very active in the spring and summer.



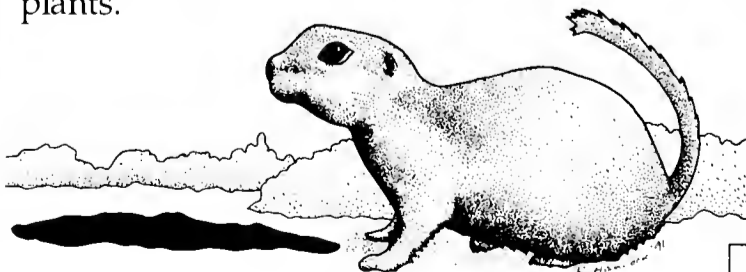
Clue: Find a lizard that might be searching the ground for food.

Many plants have flowers in the spring. Some desert plants have very tall flower stalks which are almost thirty-five feet high.



Clue: Find a desert plant with a flower stalk that is taller than you are.

The ground squirrels come out of their burrows in the spring to eat the tender new growth of many desert plants.



Clue: Find a ground squirrel or a hole which leads to a ground squirrel's home.

Membership Support

The Desert Botanical Garden wishes to acknowledge the support of all of its 6,300 members. Recognized in the Quarterly are members of the Saguaro Society, Agave Century Club, Desert Council and donations received from Oct. 1, 1990, through Dec. 31, 1990.

Saguaro Society Members

The DBG wishes to acknowledge the Saguaro Society for its leadership and generous support of Garden programs and services.

Barry M. Aarons
John and Christine Augustine
Atherton and Winifred Bean
William and Nancy Bidwell
Craig and Sharon Bolton
Robert and Karen Breunig
Dwayne and Nancy Burton
Jeanne Cameron
Bruce and Jane Cole
Roger and Judy Davis
Bennett and Jacquie Dorrance
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Desert Council

A corporate membership category, Desert Council represents an alliance between the Desert Botanical Garden and the business community.

Intel Corporation
KKLT Radio
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Motorola, Inc.
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Northern Trust Bank
Smitty's Super Value, Inc.
Snell & Wilmer
Westcor Partners
Wild Seed, Inc.

Honorary Donations

Gifts in honor of:

Dr. and Mrs. John Coleridge & Family
David Hurley
Cliff Douglas' 60th Birthday
The Staff of the Desert Botanical Garden
Caryl Foley Fitzgerald and Edward Fitzgerald
Virginia Taylor
Patty James
Joseph and Jinnett Shirley
Leslie H. Rhuart
Joseph and Jinnett Shirley

Memorials

Memorial contributions are used to provide for the ongoing horticultural, education and research programs of the Desert Botanical Garden. Contributions have been received in memory of:

Frank P. Bourgin
James and Martha Vizcaya
Harold Canaday
James and Martha Vizcaya
Frank M. Feffer
Clem Bailey
Clarice Barton
Max and Thelma Biegert
Louise Carollo
Chemonics Industries, Inc.
Barbara Connor
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George and Lucy White
John Bryant Plummer
Douglas Architecture and Planning
Mary Weinberg-Bernstein
Peter and Judith Brandeis

Gifts through the Memorial Tree program provide horticultural maintenance of the trees on Ullman Terrace. Contributions have been received in memory of:

Irma S. and Albert E. Adams
Albert E. Adams, Jr.
Wendy A. Niem
John and Mary Alderson
Audrey and Bob Alderson
Roy Andre
Andre and Whitehead Families
Everett Cargill
Elizabeth Cargill
Rodney G. Engard
Lola Engard
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Ron Kennedy and friends
Ann Brewster Lauer Krein
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Jack and Shirl Rupert
Karl L. Laubach
Helen L. Laubach

Margarete Melsbach
Uta Monique Behrens
Philip Scoville
Bette Adelman and friends
Robert Frank Swokla
Doris E. Swokla

In-Kind Donations

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Chelsea Publishers, Sales Dept.
CIDESON
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Edra Drake
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Allied-Signal Foundation
Benjamin Moore and Company
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Valley National Bank

Grants

Center for Plant Conservation



Wish List

If you're through, we wish we had....

If you have an item you believe would be useful, please call the Garden at 941-1225 for more information.

Large decorative clay pots
One- and five-gallon plastic pots
Fax machine
Working upright freezer
Upright computer desk
Fiberglass ladders, any style, any size
16-foot utility trailer
5,000-watt generator
M16 welder, portable
Steam-pressure washer
Golf/utility cart, electric or gas
1/2- or 3/4-ton tow pick-up
Hand tools
Tractor (480 or 580 or equal)
Electric demolition hammer
Reciprocating saw
Router

Belt sander
Jig saw
7 1/4" circular saw
Heavy duty cordless drill
Fork lift
Electrical testers
5 - 10 HP compressor (electric)
Spray paint equipment
Carpet-cleaning machine (steam)
Mechanic's tool box/chest
Good-quality papercutter
Kitchen blender
Two-drawer file cabinet
Four-drawer file cabinet for CPC files
Dustbuster to clean CPC greenhouse
Working refrigerator

Special Plants Await Special Donors

Donors to the Garden will soon have two opportunities to support the Garden tied directly to specific plants.

The first program, already in place and well-received, is the Memorial Tree program. Contributors of \$250 to this program may endow one of the sixty-five shade trees on Ullman Terrace in memory of a family member or friend. A beautiful acknowledgement plaque will be installed this spring. More information about the Memorial Tree program is available through the Development Office at 941-1225.



News about the second giving opportunity, an Adopt-A-Plant program, will be mailed to the membership later this year. This program, now in development by Garden staff and volunteers, will be an educational tool for members and will support the ongoing operations of the Garden. Plant "parents" will have the chance to learn more about specific plants and the region in which they grow.

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The Sonoran Quarterly.
Bulletin of the Desert Botanical Garden
Volume 45, No. 1, 1991

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THE SONORAN QUARTERLY



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Summer 1991 / Volume 45, No. 2

The Seeds of Summer A Return to the Desert Evokes a Grateful Rite

By Dr. Joe McAuliffe

It was a morning in early July and the familiar sights, sounds and smells of summer in the Sonoran Desert filled my senses. Massive saguaros and graceful palo verdes on the hillslope formed the backdrop for the unfolding drama. White-winged doves called continuously from atop saguaros; their melodious song was punctuated by the raucous laughs and chatter of Gila woodpeckers and cactus wrens. Overhead, the silent, circling paths of a pair of Harris hawks seemed to take on the graceful, yet emphatic movements of a conductor's hand, as if directing the diverse musical ensemble below.

A strong, warm breeze, whistling softly through branches of palo verdes, carried with it the pungent, fermented odor of a decaying saguaro. The massive giant was apparently struck and killed by lightning during a monsoon storm the previous year. Yet, in death, the rotting, water-laden carcass provided a special moist habitat essential to the life and reproduction of many unusual desert fruit flies, pseudoscorpions and beetles.

The downed saguaro was an old one that had seen more than two hundred summers. In the 150 years since it first started to flower, the giant had produced millions of seeds. Each seed had a vanishingly small chance of escaping predators, germinating and surviving to adulthood. Yet, given the enormous number of seeds produced during the lifetime of the passed giant, undoubtedly some of the younger saguaros on the same hillslope were its offspring.

The ripening of saguaro fruits had reached its peak a week before but many fruits were still



Dr. Joe Mc Auliffe is a research ecologist at the Desert Botanical Garden.

present, split open with their red contents laid bare for the world to see. I had just returned to the Sonoran Desert after a three-year absence and I longed to taste once again those special fruits. Finding the skeleton of a saguaro that died a decade or more ago, I selected the longest, straightest wooden rib as a pole to obtain a bit of the rich harvest.

(Continued on page 3)





PHOTO BY MARY IRISH

By Robert Breunig,
Executive Director

Summer in the Garden: Two Seasons to Enjoy

Summer is upon us and visitation to the Desert Botanical Garden will drop dramatically as many return to summer homes and retreats. For those who remain, I encourage summertime visits to the Garden. To experience the desert completely one must fully participate in its annual progression of seasons — including summer. Summer in the desert is actually comprised of several minor seasons, each of which feels distinct from the other. The Garden, an island of desert within an expanding urban sea, is a refuge in which to observe these minor seasons which might otherwise be missed or felt only in a muted way within the confines of a sealed-up city house.

The first summer “season” begins with the intense heat and dryness of June. It is a time when everything seems to wither. But at night a remarkable show begins. Night-blooming cacti blossom in this month and early morning walks through the Garden reveal the final hours of these dramatic nocturnal displays. *Peniocereus greggii*, the Queen-of-the-Night, and various other cacti in the genus *Cereus* bloom with large, white, trumpet-shaped flowers. Another impressive plant is the *Harrisia bonplandii*, an example of which snakes up and through a mesquite tree near Webster Auditorium. I have counted as many as eighty blooms on this plant on a single morning.

The heat of early summer is also a time of ripening and harvesting. The white saguaro blooms of May turn to bright red fruits and mesquite pods harden. These fruits and beans are collected by the Garden staff for year-long use in our educational programs.


The second “season” of summer begins in early July as moisture starts streaming into the state from the Gulf of Mexico. The season begins with a tease as the afternoon clouds build over the mountains, but fail to descend on our desert valley floor. It is a time of expectation, as we await the rains that will relieve the withering drought of early summer. Then, inevitably, the rains do come, although the amount and duration of the “monsoon” varies significantly from year to year. In a good year, such as last summer, there are many days with dramatic cloud build-ups followed by brief, intense, localized storms accompanied by great flashes of lightning. These storms temporarily cool the desert and release the pungent odor of the creosote bush. The Garden is always a place of strong aromas after such a storm. The rains also trigger our second wildflower season with bright displays of *Kallstroemia grandiflora*, *Cassia covesii*, *Zinnia grandiflora*, *Datura meteloides*, and *Baileya multiradiata*, to name a few.

In Phoenix, the positive experiences of summer are becoming increasingly tempered by human alterations of the environment. As more of the surface of the land is covered by asphalt, concrete and buildings, more solar energy is absorbed by these surfaces, retained and released into the night. Our summer nights are warming up. The mean nighttime low temperature in Phoenix has risen ten degrees over the past forty years! There has been some speculation about the long-term effects of this nighttime warming trend on succulent plants which have evolved a complex system of “breathing” by opening their stomata only during the cooler nighttime hours in order to reduce transpiration. A research project at the Garden on this subject has been proposed. The truth

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is that we don't know at what point this urban warming trend will end or what its effects will be.

Summer remains, at least for now, a season to be savored and enjoyed for what it is, but like so much else in nature these days, its positive qualities are under threat. Let us hope that unrelieved, human-caused nighttime heat does not become the hallmark of a new, unnatural, urban desert "season." 

(Continued from page 1)

With a firm, careful push, I dislodged a fruit. It broke loose and fell to the ground. Picking it up and examining it, I could see I was not the first to partake of the rich bounty. The top third of the seed-laden red flesh had been consumed, probably by white-winged doves. The doves remove and carry large quantities of the ripe pulp back to their nests and regurgitate the sweet, rich food to feed their young. Such a manner of feeding can be a messy proposition and some of the pulp, with its masses of tiny black seeds, misses its target of an open, begging beak and ends up on the ground below. Some of these seeds eventually germinate and survive. This inadvertent transportation of seeds by birds to areas beneath tree canopies is one factor contributing to the abundance of small saguaros beneath various nurse trees.

The bulk of the sweet pulp remained in the fruit I had collected. Exposure to the morning air had accelerated its ripening and increased its succulence. A couple of tiny red ants hurried about in their formicid frenzy on the surface of the pulp. I hurriedly tried to brush off the ants (although in my eagerness to eat the fruit I can't remember whether I actually removed them) and I pressed the pulp from the outer rind into my mouth. Squeezing the pulp between my tongue and palate, I tasted the rich sweetness. Slowly I chewed the pulp and seeds, giving thanks for my return to the Sonoran Desert and for this special fruit the saguaro shared with me, the white-wings and yes, even the ants.

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"The extraordinary becomes in summer the accepted."

— Marjorie Kinnan Rawlings

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Editor: Carol Schatt
Design: Moonlight Designs
Illustrations: Moonlight Designs

...people have always
ascribed magic and mystery
to the night.

4
(Continued from page 3)

I continued my walk, abandoning my first saguaro-rib pole for a slightly longer one. The sweetness of the dozen-or-so additional fruits I collected and ate intensified my celebration of oneness with the Sonoran Desert.

From the final fruit I collected, I removed a couple dozen of the small, black seeds before consuming the pulp. Cradling the tiny seeds in my fist, I walked to the edge of an east-facing cliff where a large, healthy palo verde had grown next to a giant, rounded, granite boulder. Beneath the primary canopy of the palo verde were several small canopies of triangle-leaf bursage. I planted the saguaro seed in the fine, rich litter under one of the bursages.

This is the kind of micro-environment where many saguaros have started life. The extra runoff from the boulder and cliff face should give the seeds a better chance than most to germinate this summer and survive their first critical year. If the seeds do germinate, the double-decked canopy of bursage and palo verde will provide the young cacti with a partially shaded refuge from the intensity of the summer sun. Without such shade, a young cactus would cook on the surface of the exposed earth. In addition, the eastern exposure, together with the protective canopies, would protect young saguaros from lethal frosts.

I sat next to the lone palo verde for quite some time, offering up my own sort of prayer...that one of those seeds would germinate, grow and eventually mature. And then, two centuries from now, long after I'm gone, white-winged doves collecting the sweet pulp of saguaro fruits for their young will visit that saguaro and continue to partake in this heartfelt communion. ☪

The DBG would like to thank this season's
sponsors of Music in the Garden:

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Why Bloom at Night? Nocturnal Wonders Have Their Reasons

By Mary F. Irish

Perhaps it is because we rely so heavily on our sense of sight or perhaps because our body rhythm awakens with the sunlight, but people have always ascribed magic and mystery to the night. In the desert, summer nights do have their own magic — and mystery.

Many mammals are active only at night, some birds sing and hunt only at night, and many desert plants perform a crucial segment of their food production at night. (Their stomata open to take in oxygen for photosynthesis later.) But the mystery is why some plants bloom at night.

While cacti are not the only plants which bloom at night, they are one of the most spectacular. Night blooming offers many advantages from a cactus' point of view.

Flowers and subsequent fruit are an enormous drain on the energy resources of a plant. All of this energy-cost is worthwhile because this will result in the next generation.

Flowers are structured differently from a plant's skin, and they lose water much faster. They are, in effect, a window. In a dry, hot climate this means that water lost through a flower either cannot be replenished or is replenished to the detriment of other parts of the plant. One solution to this problem is to bloom at night when the temperature is much lower.

Another reason to bloom at night is to attract pollinators who are active then. Bats visit saguaros and are a primary pollinator of the plant, moths visit numerous species of night-blooming cacti and act in the same way. Nearly all cacti are vector-pollinated — that is, some outside agent such as an insect, animal or bird must move pollen from one plant to another. Thus, attracting the right pollinator is very important.

(Continued on page 5)

To watch a night-blooming plant come into flower is to marvel...but it is a wonder for one night only.

This also helps to explain why many night-blooming cacti are so very fragrant. Moths in particular are drawn to the sweet cloying fragrance of the *Peniocereus greggii*, the extraordinary *Selenicereus* and *Hylocereus*, and of course the more common *Cereus peruvianus*. Some research even suggests that the type of fragrance appeals to a specific type of pollinator; for instance, musky, acrid smells tend to attract bats, while sweet floral scents entice moths.

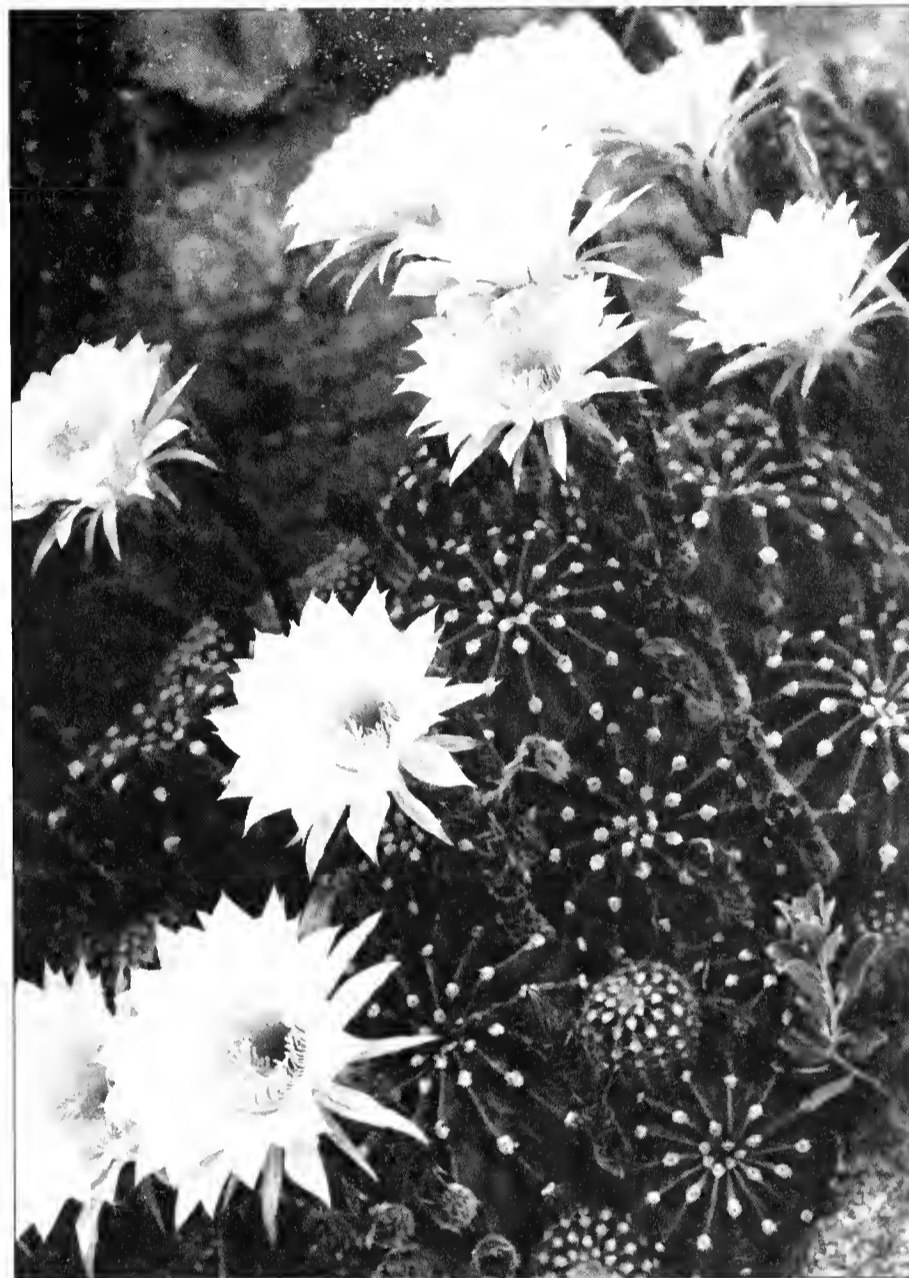
After observing night-blooming cacti a while, one notices that they usually are white or cream-colored. White is a color most visible in low light, such as at night. In addition, most night-blooming flowers are large. A successful formula for survival: lure your pollinator with a fragrance and help it find you with that large, white spotlight of a flower.

To watch a night-blooming plant come into flower is to marvel. First the sepal-like coverings begin to unfold and with a mighty pop burst open. Then the petals, usually numerous, begin to expand, then jerk, and finally in a great sigh the entire bloom opens all at once. But it is a wonder for one night only.


Almost all night-blooming cacti flowers last for just one night. Some, such as *Harrisia bonplandii* and *Harrisia martinii*, have an extraordinary number of blooms which open over a series of days. But even then each individual flower is open only for one evening.

Night-bloomers generally open well into the evening, beginning any time after sundown and continuing through the night. Flowers start to fade as soon as the sun comes up, but will remain open and fresh for as long as the sun does not strike them. By mid-morning all from the previous night are spent and the process of developing seed and fruit has begun.

To see night-blooming cacti in the Garden, look for the *Peniocereus greggii* plantings. These plants typically bloom in mid-June. The largest groups are on the main trail near the island bed, at



The night-blooming Echinopsis.

the first bridge, and near the old public restrooms. *Harrisia bonplandii* and *Harrisia martinii* both put out exceptional blooming shows at the Garden from late May through June. They are located just north of Webster Auditorium near the stairs. The bed of mixed *Echinopsis* by the second bridge is perhaps the most repetitive display. Bloom commences in late April and will occur at irregular intervals throughout the summer. Other night bloomers are in the Cactus House and near the petrified wood bed. 

Mary Irish is in charge of the Garden's greenhouse sales and sale-plant propagation programs.

Fruits of Summer Meant New Year To Native Peoples

By Carol Schatt

*The desert is our home.
There where saguaro are many,
Where greasewood is green,
Smelling nice.
The desert is cactus fruit,
Prickly pear, cholla, mesquite beans.
The desert is work, but for our good.
The desert is for our good.*

*—"Tohono/Desert"
by Helen J. Ramon

In late June the winter rains are only a memory and the rains of summer are weeks away; puddles have vanished from this dry land, and the days are the longest of the year.

It is now, when spring's bounty of fresh greens and wild berries have played out, that desert creatures look for sustenance from other food plants of the Sonoran Desert including the saguaro cactus, indicator plant of this Desert – indeed its very signature – and the mesquite, known as the "tree of life."

Modern desert dwellers may look on summer with less than delight; they may escape to the cooler mountains. But summer was a special time to the Sonoran Desert people; it was the season in which the year's cycle began anew. The Tohono O'odham would hunt in the mountains in the winter and would come to the desert in summer to farm and gather wild foods.

Harvest of saguaro fruits in June and July heralded the year's beginning for the O'odham people in Arizona. For the Seri people of Mexico, gathering mesquite beans in August signalled the start of a new cycle.

The saguaro fruit harvest was like a festival of gladness. With long sticks made of cactus ribs, the women punched the juicy, red, seed-packed fruits off the tall saguaro spires. The people used the fruit in several ways. As they worked they feasted off the fresh fruit, sweet, moist and laden with nutritional value. The women put aside for later consumption the fruits which had been sun-dried at the tops of the plants. They cooked down much of the fruit, straining the seeds from the juice, which was boiled until it became a thick, sweet syrup to be stored and used later like honey. The seeds, oily and plentiful, could be pulverized into a kind of meal to be added to gravies and stews. Or, cooked with ground cholla buds and cornmeal, they became a nutritious porridge. After the seeds were removed from the red, fibrous pulp, it could be mixed with some of the syrup to produce a delicious jam which is still sold on the Tohono O'odham reservation.

An important part of the saguaro harvest was the *ha-ashan navait* ceremony of the Tohono O'odham. Each family shared a portion of its saguaro fruit syrup to make a mild wine. With songs, dances, sermons, and wine-drinking, this ritual was performed to bring the summer rains, "to pull down the clouds."

Mesquite was a major wild food staple not only for Seri and O'odham people, but for Apaches and other native groups. The bean pods, which ripen in summer, were collected and preserved as a mainstay in the year's food supply.

The pods were most commonly used by being ground and sifted into flour, or cooked. In one variation of the latter recipe, pods were boiled until they fell apart, the stringy pod material discarded, and the remaining broth used to cook dumplings made of wheat flour. (Wheat, introduced in the 1700's by the Spaniards, spread quickly from village to village and was widely grown by the O'odham.)

Mesquite flour, moistened with water and shaped into balls, provided concentrated, portable nutrition for native people "on the go."

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The Seris considered mesquite beans so important to their livelihood that they developed eight names for mesquite pods according to their stages of development. The Seri people have several recipes for mesquite from the tender, small, green pods to the dry and mature beans.

And for the hatchling birds, the kangaroo rats, and other desert creatures, from tortoise to coyote, the summer's fruits of saguaro and mesquite mean food and moisture that will see them through to the next rainy season. 🌵

*By permission, Helen J. Ramon
"Tohono/Desert," in *When It Rains: Papago and Pima Poetry*,
Ofelia Zepeda, editor, Tucson: The University of Arizona
Press, 1982



Field Notes

Studying the Pressures on a Border-Shared Species

At the border shared by the U.S. and Mexico, considerable differences can be observed between plant communities of the two nations. On the U.S. side, because of periodic governmental efforts to curb overgrazing, the plant community looks partially recovered. The Mexican side of the border, however, exhibits a greater degree of degradation affecting plants.

Dr. Gary P. Nabhan and his Mexican colleagues are surveying the rare, night-blooming *Peniocereus striatus* on both sides of the international boundary. *Peniocereus striatus* shares characteristics with its close relative *Peniocereus greggii*, a favorite at the DBG known as Arizona queen-of-the-night. (Profiled on p. 9). Like *P. greggii*, *P. striatus* resembles nothing more than uninteresting sticks masquerading as branches of one of their nurse plants, *Larrea tridentata*, creosote bush, and rising from a large underground tuber. In June, however,



Dr. Gary P. Nabhan

P. striatus bursts forth with extravagantly fragrant, creamy-white blooms to lure its favorite pollinator, the white-lined sphinx moth.

Having located only seven individual *P. striatus* plants in a ten-month period, Gary discovered in the fortunate serendipity of a brief desert storm that rainfall turns creosote bush branches black and *P. striatus* stems the bright green of photosynthesis. In less than an hour he was able to locate eleven more plants in the study area.

He has also observed the flowers, usually about three inches across, to glow at night almost like flashlights — visual beacons to their nighttime pollinators.

What environmental pressures are working against *P. striatus*? The O'odham Indians, who inhabited the area with no regard to political demarcation lines, used the plants occasionally for medicinal purposes but had no real impact on the cacti.

The real culprit, Dr. Nabhan felt initially, would be identified as livestock. It would be shown later that cattle had browsed the shrubby vegetation so necessary as a nursery environment to the *P. striatus*, which also led to an inhospitable rise in windspeeds and temperatures.

Looking at the scars of woodcutting on trees in his study area however, Gary discovered that the cutting of ironwood, palo verde and mesquite trees was having an even greater impact on the presence

(Continued on page 8)

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of nurse-plant vegetation. Deforestation is as devastating in deserts as in rainforests! The trees were being cut not only as firewood for Mexican people living near the border, but also for the production of animal woodcarvings for the tourist trade — often mass-produced by non-Indian craftsmen using mechanized tools.

Gary also realized that *P. striatus*, unusual in so many ways, is highly prized by horticulturists in Japan and Europe, and has been illegally collected and exported for high prices abroad. Some illegal collections have frequently been made by using documentation for scientific studies of the plants which conveniently cite the locations of the plants!

Nabhan also noted that illegal cactus removal occurs most frequently in areas under governmental protection such as parks and refuges which attract greater concentrations of visitors. The Tohono O'odham reservation near the border has also experienced heavy losses to theft within its large, unpatrollable acres.

Dr. Nabhan's studies are also demonstrating that cactus communities in one country are very dependent on what happens in both countries. They share the white-lined sphinx moth as a pollinator, whose larvae are a threat to cotton growers. The growers respond with pesticides. Destruction of the larvae may be good for cotton plants, but it threatens cacti dependent on the moth for pollination. 🌵

Dr. Gary P. Nabhan, assistant director for research/collections at the Garden, is an author and research scientist. He is a recent recipient of a MacArthur Foundation grant and a scholarship from the Pew Charitable Trust.

VOLUNTEERS SPENT 31,210 HOURS
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IN 1990!



PHOTO BY JOE MCAULIFFE

A giant specimen of Stenocereus weberi dwarfs scientists doing research in Mexico's Tehuacan Valley.

DBG Ecologists to Study Plant-Rich Arid Region

Two DBG ecologists will be conducting research this fall in one of the most biologically rich of the earth's arid regions — the Tehuacan Valley in Mexico.

Dr. Joe McAuliffe, a staff research ecologist, and Dr. Alfonso Valiente-Banuet, a visiting ecologist from the *Universidad Nacional Autónoma de México*, will be seeking information suggesting ways in which livestock grazing and other human activities there can be sustained without sacrificing the region's biological diversity.

The study is being undertaken with the help of a \$15,153 grant from the Biodiversity Support Program, a research program funded jointly by the World Wildlife Fund, the Nature Conservancy and the World Resources Institute/Center for International Development and Environment.

Together with a team of four other scientists, including ecologists, ethnobotanists and specialists on impacts of livestock grazing, Joe and Vali will document the ways in which the wild plant populations of the Tehuacan are used and impacted by human populations. Dr. Gary Nabhan, DBG

assistant director for research/collections, will contribute his ethnobotanical expertise to the project.

The Tehuacan, a small valley 125 miles southeast of Mexico City, is isolated by rugged mountains on both sides and contains a greater number of different cactus species than any other area of comparable size in the western hemisphere. About sixty species of cacti are found there, six of them as large or larger than the saguaro. The geographic isolation of the valley has resulted in the evolution of a surprising number of endemic plants, plants found there and nowhere else. Nearly a third of the area's plants are endemic.

The project will be conducted during a five-week period in October and November. 🌵

This Unusual Plant Can Take Your Mind Off Summer's Sizzle

Peniocereus greggii
Arizona queen-of-the-night

It is June. The buzz of cicadas is deafening. The afternoon heat will take your breath away and most thoughts turn to whatever it takes to avoid the heat. But if you are observant, rise early or stay up late, you can witness one of the finest blooming spectacles the Sonoran Desert has to offer — the bloom of the *Peniocereus greggii*.

A cactus of unusual proportions and appearance, *P. greggii* arises from a vastly swollen root to wind its long thin stems (which most closely resemble dead sticks) around creosote bush or mesquite. This camouflage succeeds. One hardly notices the plant unless the bloom or fruit give it away.

Like many other night-blooming plants, *P. greggii* produces a large, somewhat tubular, white flower that is extraordinarily fragrant. Flowers are about eight inches long and nearly four inches across. All of these features — color, fragrance and size — help to lure pollinators, especially moths, to the nectar in the flower. There, the pollinator brushes against the sticky pollen and carries it to other blooms. Bloom is so restricted and well coordinated

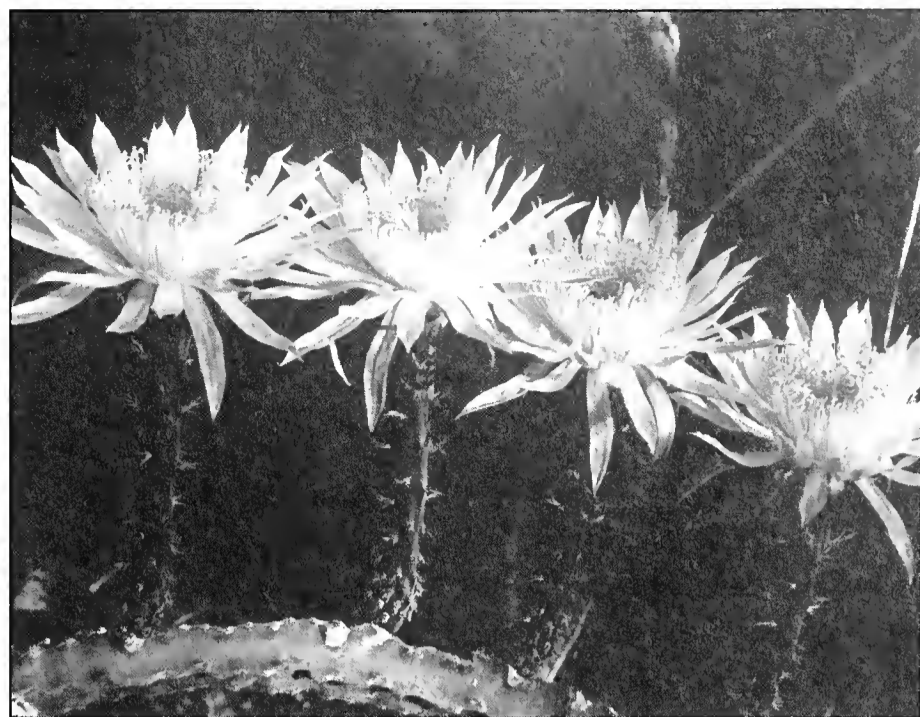


PHOTO BY TOM NORRIS

The Peniocereus greggii.

in this plant that it is commonly thought that all *P. greggii* in an area flower within a two- or three-night period.

Bloom is typically near the middle of June in the Garden. Individual blossoms last for only one night but will hold on the plant through early morning until the sun reaches the flower.

The fruit is large, red and considered edible. Birds and small mammals find it tasty and their interest helps spread the seed. Because birds perch in small bushes, seed is usually deposited through their droppings in highly suitable germination and growing sites.

P. greggii is native not only to southern Arizona but also to extreme southwestern New Mexico, western Texas and into Mexico through Sonora, Chihuahua and Zacatecas. A plant of very low elevation, it is found below 1,500 feet.

Although not visible, one of the most striking features of this plant is its water storage tissue in the root. The swollen roots can become enormous, some weighing fifty pounds or more, though they generally weigh five to fifteen pounds. The use of root tissue for water storage is not common in cacti and begins in this plant at the seedling stage.

At the Desert Botanical Garden, *Peniocereus greggii* var. *transmontanus* is a part of the Center for Plant Conservation (CPC) collection. (See related article The Sonoran Quarterly Spring 1991.) This variety is found in southern New Mexico and southwestern Arizona and is rare in portions of its range. Under the CPC program, the DBG now has frozen seed and pollen. Experiments are also underway to determine the best method for rooting the plant from cuttings. Other *P. greggii* are found throughout the core garden, near the first bridge and by the old public restrooms. 🌵

Salvage Trips Bring New Plants, 'Old' Landscape Back to DBG

By Marjorie H. Roberts

The Desert Botanical Garden horticulture staff and volunteers have gathered hundreds of plants for the Garden on salvage trips in an area north of Phoenix which will be submerged in 1993 by an enlarged Lake Pleasant.

Using ordinary garden equipment, the salvage teams collected specimens which included six-foot tall saguaros, giant ocotillos, huge cacti and mature teddy bear chollas. More than three hundred smaller plants were also collected.

"This salvage, organized by Cesar Mazier, will improve the representation of Central Arizona flora in our collection. One of the major goals of the Collections Department is to boost this collection and emphasize local flora in the Garden," Liz Ecker, Curator of the Living Collection, said.

Cesar Mazier, superintendent of horticulture, noted specific deficiencies in local flora in the Garden collection including teddy bear chollas (previously removed from Papago Park for safety reasons), mature ocotillos, ephedras (Mormon tea) and fairy dusters. Mazier said, "The Lake Pleasant salvage was an opportunity to enhance the Garden's collection of specific plants before they were drowned."

The DBG was allowed to salvage these plants through a special permit granted only to scientific and educational institutions by the Arizona Department of Agriculture. The Garden is responsible for detailed reporting to this department regarding what has been collected and from where.

Staff members also collected field data for the computer record which included the locations of plants and horticultural information about where the plants were growing, slope, exposure, amount of sun and shade, the surrounding plant community and other data deemed applicable to future studies.

Marjorie H. Roberts is a volunteer who works as a horticultural aide at the Garden.



DBG staff and volunteers salvage "Gemini" from Lake Pleasant site.

Species Collected At Lake Pleasant Site

<i>Anemone tuberosa</i>	<i>Mammillaria grahamii</i>
<i>Calliandra eriophylla</i>	<i>Oenothera primaveris</i>
<i>Carnegiea gigantea</i>	<i>Opuntia acanthocarpa</i>
<i>Dichelostemma puchella</i>	<i>Opuntia bigelovii</i>
<i>Echinocereus engelmannii</i>	<i>Opuntia fulgida</i> v. <i>fulgida</i>
<i>Ephedra fasciculata</i>	<i>Opuntia leptocaulis</i>
<i>Eriogonum fasciculatum</i>	<i>Penstemon</i> sp.
<i>Eriogonum inflatum</i>	<i>Sphaeralcea</i> sp.
<i>Ferocactus cylindraceus</i>	<i>Trixis californica</i>
<i>Fouquieria splendens</i>	<i>Viguiera deltoidea</i>
<i>Lycium berlandieri</i>	

“An ecologist is like a detective who sees patterns of nature...”

Someone to Know:

Research Ecologist Stepped Into “Another World” When He First Saw Desert

Ten years ago, Joe McAuliffe had never seen the desert. Then one spring morning he opened his eyes to the sight of blooming ocotillo and cacti in Organ Pipe National Monument.

“It was like stepping into another world,” he recalls, “a world where the rules of forest and heath seemed not to apply. I was so captivated by the desert plants — their shades, forms, distribution.”

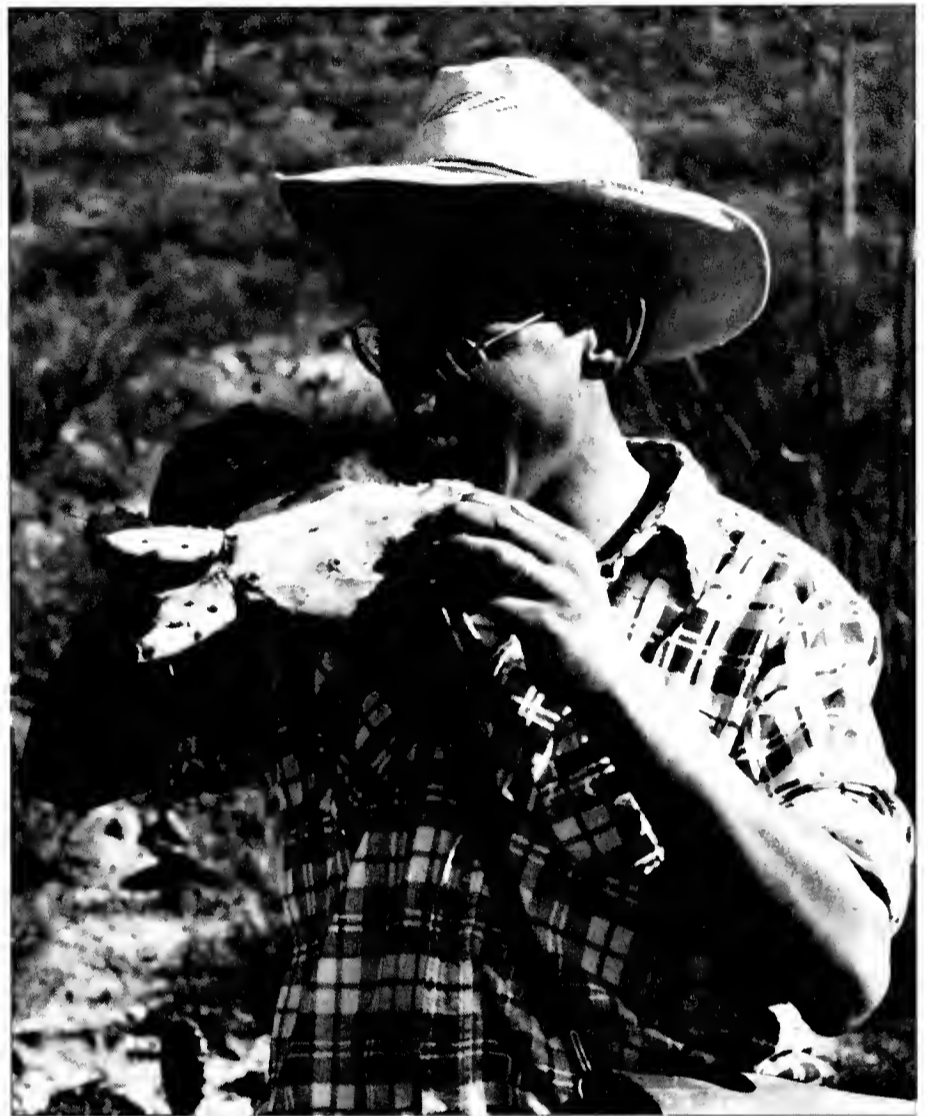
In a mind-numbing, 36-hour marathon drive from Montana to southern Arizona, he had turned the wheel over to a fellow driver in Flagstaff and awakened in Organ Pipe.

He prowled over the desert landscape with the dozen biology students he had brought on a field trip from the University of Montana. When they returned to the north country, Joe’s heart stayed in the Sonoran Desert. And he kept coming back to Organ Pipe for mid-winter camping and field study trips, probing the desert adaptations of those “rules of forest and heath” which, of course, do apply to this arid land.

Now he continues to study the desert, its inhabitants and their interlaced lives. A research ecologist at the Desert Botanical Garden, he came here primarily to assist in an advisory role with a restoration ecology project involving abandoned farmland in Arizona.

Joe, who earned his doctorate in 1983 at the University of Montana in Missoula, grew up in Nebraska. With an undergraduate degree in conservation and wildlife biology from the University of Nebraska he started graduate studies at the University of Pennsylvania in Philadelphia.

“But I soon said to myself, ‘What’s a boy from Nebraska doing here?’ And that’s when I came back out west to Montana,” said Joe.



Dr. Joe McAuliffe in the field.

After finishing his graduate studies he passed up several opportunities elsewhere in favor of a half-time position teaching introductory biology at the University of Arizona from the fall of 1983 through the spring of 1986. During his last year there he worked at the Desert Laboratory at Tumamoc Hill, the site of the old Carnegie Laboratory where Forrest Shreve pioneered the field of desert ecology in the early 1900’s. Joe’s work there was to design a development plan for the laboratory as a focus for Southwest desert environment studies.

From the fall of 1986 until he came to the Garden in spring, 1990, Joe was an assistant professor in biological science at the University of Nevada at Las Vegas. Those years spent in the Mohave Desert were a “great experience,” Joe said. His studies of desert soils, begun while he was in Tucson, developed considerably in Nevada,

(Continued on page 14)



Desert Gardener

Those Desert Plants Do Need A Drink; Here's How Much

Although desert plants have developed numerous mechanisms for conserving and in some cases, storing water, none has completely given up the need for water. It is a widely held belief that desert plants do not need water. This is not the case.

It is true that desert-adapted plants use less water than their temperate-zone counterparts. And it is true that desert plants are considerably more conservative in using the water which they receive. But when plants are described as being desert or low water-use plants, they are just that. They are plants which have adapted to the soil, the temperatures and the water regimes of deserts. Such plants will be able to achieve maturity, flower and fruit and look their best on much less water than plants which are not from such an area. That is one of the benefits to using desert plants in a landscape.

For gardeners in the Valley there is another point to remember. There are deserts that are somewhat cooler, deserts that are drier and deserts that have a bit more rain. Plants from any of these areas will require growing situations more like their native homelands to look their best.

The first thing to consider when establishing a watering regime for plants in your garden is the age and size of the plant. Young or newly transplanted plants need considerably more water than older, more established plants.

Next, one must think about the soil conditions in which the plants are growing. Some soils in the Valley have a very high clay content which retains moisture quite well. In some cases, clay soils hold moisture too well and need to be amended with organic matter and/or sand. This will help loosen the soil and build a better structure.

In very rocky soils the addition of some organic matter is usually helpful for trees or shrubs because there is so little available in the soil. Rocky soils also drain quickly as a general rule, and it is likely that watering may have to be increased.



How you water can be important not only to the plants but also to your water bill. By far the most efficient way to water is some form of drip irrigation. Drip irrigation is a system whereby a tiny amount of water is applied directly to the root zone over a fairly long period of time. It has two immediate advantages: All water is received directly in the root zone of the plant where it will do the most good and very little water will evaporate before it reaches the root zone.

There are many types and styles of drip irrigation equipment. Whichever kind you use, be sure that when you water your plants the system runs as least two hours for each watering with an emission rate of at least one gallon per hour. This will ensure that the plant is being watered deeply. About every fifth watering, let the irrigation run eight to ten hours in order to encourage the leaching of salts from the surface of the ground.

One can also water with a hose and a bubbler. This method also directs water to the root



PHOTO BY JIM METCALF

zone. Running water slowly allows more of it to soak into the ground without evaporating. Coupled with basins or other catchments, however, the hose and bubbler can work very well, especially if you have few plants.

In any watering regime, watch newly planted specimens carefully. Any sign of wilting, leaf drop or lack of vigor could indicate the plant needs water. This is especially true for plants put out in the spring which could face heat stress. Also, plants planted from one-gallon containers will require more water than larger plants.

All woody plants, both trees and shrubs, require regular, deep watering. This encourages strong root growth which is crucial to the formation of a healthy mature plant. The need for careful and regular watering is especially critical during the first two years of a plant's life. Young trees are particularly sensitive to deep watering in their early years because so much growth is directed into root establishment.

Further information and an excellent fact sheet are available by telephoning the Garden's Plant Hotline at 941-1225 between 10:00 and 11:30 any weekday morning. ☞

General Watering Guidelines for Trees and Shrubs after Planting

<i>Planting time</i>	<i>Duration</i>
Spring	every 3 days for 3 weeks every 5 days for 1 week
Summer	every 2 days for 3 weeks every 4 days for 2 weeks every 5 days for 1 week
Fall	every 3 days for 2 weeks every 5 days for 1 week

General Watering Guidelines for Shrubs

<i>Temp. range</i>	<i>1st year interval</i>	<i>2nd year interval</i>	<i>3rd year interval</i>
below 75°F	30 days	30 days	4-5 weeks
75-90	2 weeks	3 weeks	4-5 weeks
90-100	10 days	2 weeks	3 weeks
over 100	1 week	10 days	2 weeks
over 108	1 day	3 days	1 week

General Watering Guidelines for Trees

<i>Temp. range</i>	<i>1st year interval</i>	<i>2-5 years interval</i>	<i>5+ years interval</i>
below 75°F	30 days	30 days	60 days
75-90	2 weeks	3 weeks	60 days
90-100	10 days	2 weeks	6 weeks
over 100	1 week	10 days	3-4 weeks
over 108	2 days	10 days	3 weeks

Research Ecologist cont.

particularly in the exploration of patterns of plant distribution in relation to soils.

These studies continue here as Joe works with Dr. Laura Jackson, also a DBG research ecologist, on her restoration ecology project. They are exploring the re-establishment of long-lived desert natives such as creosote bush and saltbush on abandoned farmland. There are about a thousand square miles of land in Arizona that were formerly irrigated and produced cotton until they were abandoned in the 1950's. The two scientists are exploring soils, patterns of seed distribution and other factors involved in the reclamation of the cleared farmland by native species.

"An ecologist is like a detective," says Joe, "who sees patterns of nature and looks at the relationships between plants, animals and their environment — and this includes humans, too.

"One of the roles of an ecologist," Joe points out, "is to study things in an unbiased way. We live in a city of two million people. The impacts of such a human population are a reality and we must better understand how people are a part of the ecological landscape."


He will be looking at the reality of human pressures on "wild" landscapes this fall in a project for the World Wildlife Fund investigating how the goatherds of the Tehuacan Valley in Mexico can make a living without their animals causing severe degradation of the lush, park-like environment of the area. (See related story p. 6). "A goatherd may not be ecologically wise, but these factors can co-exist. We live in an affluent society and often are so eager to apply our aesthetic desires that we want to manage the world. Trying to impose the standards of the Western world on a starving people won't work." 



PHOTO BY JIM METCALF

No Longer a Wallflower, This One Shows Its Colors All the Way Through the Heat

Tecoma stans

Arizona yellow bells, esperanza, retamo, tronadora, yellow elder

As happens often in both life and horticulture, that which is closest is frequently unappreciated. Such is the case with *Tecoma stans*, yellow bells. Long used as an ornamental plant in Egypt and the Mediterranean and throughout the warmer parts of Mexico and the Caribbean, this Arizona native is only recently becoming a valued part of the ornamental flora of the Valley.

Yellow bells distinguishes itself with a stunning and prolific display of tubular yellow flowers. Each flower is between two and three inches long. Bloom begins in the late spring and continues uninterrupted until frost. This is one of the finest features of the plant for the Valley as it provides summer color at a time when color can be difficult to achieve.

Yellow bells is a woody shrub which can reach fifteen feet in height and will spread four to eight feet. The size of the plant will depend greatly on how much frost damage it suffers.

The plant is fairly frost tender and in heavy frost will freeze entirely to the ground. However, like another summer bloomer, bougainvillea, it is very root hardy, recovers quickly, and will bloom the same year following frost damage.

Yellow bells is native to Arizona, southern New Mexico, the trans-Pecos region of Texas, and southern Florida as well as throughout the warm

regions of Mexico, the West Indies, and into South America. In Arizona it occurs in the southern part of the state from an elevation of 3,500 to 5,000 feet in gravelly washes, ledges, cliffs, and rocky hillsides.

Cultivation is relatively simple in the home landscape. Yellow bells can be planted in either spring or fall, but fall planting requires good frost protection in the first year. The plant thrives in full sun, and can be placed successfully on the hottest exposure available. Some overhead protection will guard it against light frost, but because it recovers so rapidly even that is not absolutely necessary. Regular deep waterings throughout the hottest part of the summer help keep the plant in good vigor and good bloom. Fertilization is usually not necessary. Pruning to keep a good shape and to remove frost damage is recommended and can be done throughout the growing season. Yellow bells is a stunning accent plant as well as a brilliant display near a wall.

There are two varieties of yellow bells. *Tecoma stans* var. *angusta*, the variety native to the northern and western extent of its range, is recognized by its thinner leaflets. It is more cold hardy and drought tolerant than *Tecoma stans* var. *stans*, which has a large bloom and leaf. *T. stans* var. *stans* is more likely to be found in the frost-free portion of the plant's range.

When next you consider summer color, remember yellow bells. This lovely Arizona native will brighten any garden during our long summer. ☺

FRIENDS OF THE GARDEN
CONTRIBUTED \$20,000 TOWARD THEIR
\$40,000 PLEDGE TO THE GARDEN
IN APRIL FOR ADDITIONS
TO THE IRRIGATION SYSTEM.
THANKS!



Mexican ecologist Dr. Alfonso Valiente-Banuet will be at the DBG for the next year.

Visiting Mexican Ecologist To Do Research Here

We warmly welcome Dr. Alfonso Valiente-Banuet, who will be in residence at the Garden this month through May, 1992 for post-doctoral research with Dr. Joe McAuliffe.

Dr. Valiente-Banuet, or Vali, received his doctoral degree from the prestigious Centro de Ecologia of the Universidad Nacional Autonoma de Mexico in Mexico City. His doctoral research has involved ecological studies on a variety of desert plants, especially the giant columnar cacti of the Tehuacan Valley in south-central Mexico.

During his year in Phoenix, Vali will participate with Joe in projects involving conservation and ecological research in both the United States and Mexico. ☺



The night-blooming Harrisia.

Delights for the Early Riser: Cool-hour Tours Feature Night Bloomers, Birds, Plants

Early-morning tours are scheduled this summer at the DBG to take advantage of pleasant daylight hours and to showcase Garden features not normally seen later in the day.

"Taste of the Desert" sunrise tours will begin at 7:15 a.m. each Tuesday and Thursday in June and July. Starting from the Admissions booth, these one-hour, docent-led tours may catch the last sights and scents of night-blooming cacti before they close for the day. The tours will conclude at Archer Patio with a taste of prickly-pear punch.

A Saguaro Sunrise Tour is set for 7:15 a.m. on Saturday, June 15, and Wednesday, June 26. This one-hour docent-led tour will emphasize the importance of the saguaro, whose fruit has been a food staple to native people for hundreds of years. The tour, which begins at the Admissions booth, will conclude with a taste of saguaro fruit cookies.

The "tree of life" will be featured on a Mesquite Sunrise Walking Tour on Wednesday July 17, and Saturday, July 27. Mesquites have provided food, shade, shelter, medicines and fuel for hundreds of years. The one-hour, docent-led tour,

beginning at 7:15 a.m. at the Admissions booth, will conclude with cookies made from mesquite flour.

The popular "Birds in the Garden" walking tours will continue each Monday through summer. Binoculars and comfortable shoes are recommended for this one-hour, docent-led tour which leaves the Admissions booth at 7:15 a.m.

Don't miss the new Moonlight Desert Walks during the full moons of June, July and August. These 90-minute guided tours are limited to 50 people each night and will give visitors the opportunity to witness the Garden's nighttime transformations. Bring your flashlight and call for reservations.

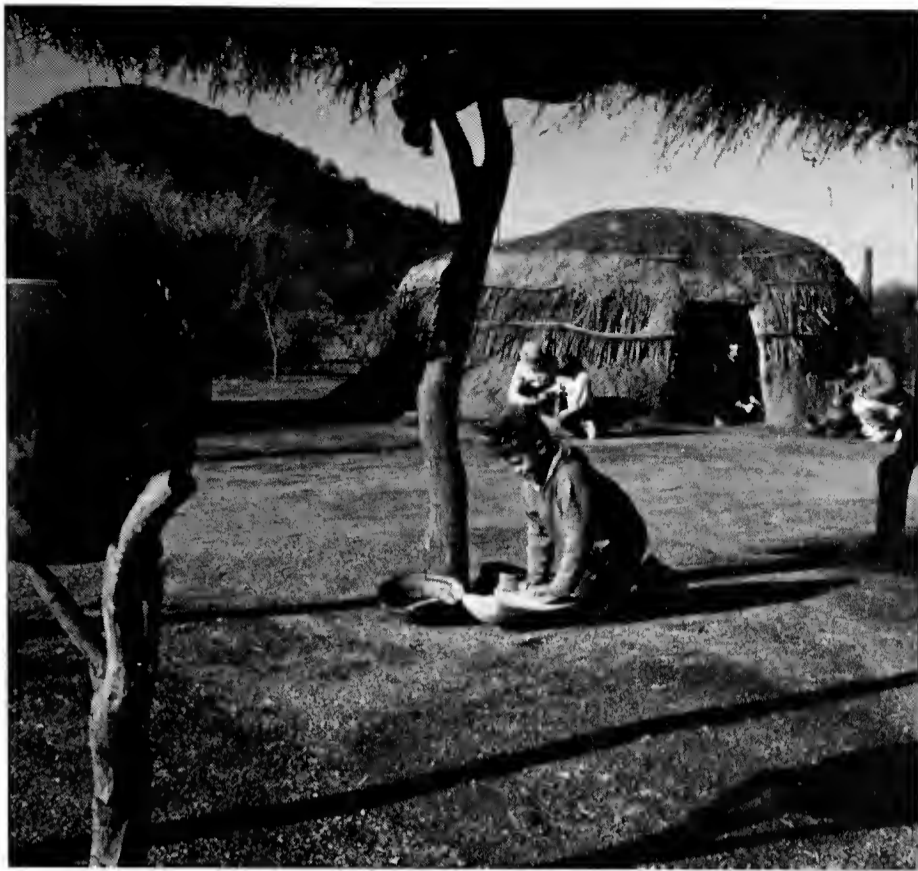
And be sure to watch KTVK-TV3's 6:00 p.m. weather reports for fast-breaking updates on those unpredictable night-bloomers. The Garden will open at 6:00 a.m. on those days when the displays will be particularly spectacular and Royal Norman will let you know when that will be.

All tours are free with admission to the Garden. ☜

Summer Workshops Will Look at Desert Edibles and Crops

If you want to know more about how native people lived in the desert, you may be interested in some ethnobotanical workshops during the Garden's summer program.

A Saguaro Fruit Harvest workshop on Saturday, June 22, will show the traditional way to harvest the fruit and separate seeds from juice. Workshop participants will taste foods made with saguaro fruit while learning about the importance of the plant to desert wildlife and humans. The workshop will be conducted by Garden staff member Ruth Greenhouse, an ethnobotanist, in the cool morning hours from 6:30 to 10 a.m. in Webster Auditorium. Fees are \$16 for members of the Garden, \$20 for non-members. ☜



Enjoy our Plants and People of the Sonoran Desert trail.

On Saturday, August 17, Ruth will lead a workshop focusing on edible wild food that can be collected and harvested during the summer, especially from the bountiful mesquite tree and the prickly-pear cactus. Workshop hours will be from 7 to 10 a.m. in Webster Auditorium. Fees for the session are \$14 for Garden members, \$18 for non-members.

Two activities for children will spotlight important desert crops. On Wednesday, June 5, an A-"Maize"-ing Corn workshop for children in kindergarten through third grade will be held in Archer House from 8:30 to 10 a.m. It will deal with corn cookery, including making blue corn muffins and tortillas and popping blue popcorn. Traditional corn legends and creative movement will also be included. The instructor is Barbara Gronemann. Fees are \$10 for Garden members, \$12 for non-members.

Children will learn more about another desert crop in the All About Cotton workshop. They will process cotton by ginning, carding, spinning and weaving in the two-session workshop from 8:30 to 10:30 on Thursday and Friday, July 25 and 26 in Webster Auditorium. Cost of the workshop for Garden members is \$10, for non-members, \$12. Barbara Gronemann is also the instructor for this workshop.

Registration in advance is required for each of these workshops and may be made by telephoning the DBG at 941-1225. ☎



Summer Calendar Highlights

Summer is a time of growth and bounty at the Garden. The plants of the desert can teach us much about adapting to and enjoying this season which can seem so brutal. Treat yourself to a leisurely walk through the Garden in the cooler morning or evening hours. Our workshops can help you and your children learn more about harvesting the abundance of summer. Summer hours at the Garden are from 8 a.m. until sunset.

Trail Activities

Desert Moonlight Walks
Early-morning Night-blooming Walks
Birds in the Garden
"Taste of the Desert" Sunrise Tours
Saguaro Sunrise Tour
Mesquite Sunrise Tour

Desert Landscaping and Horticulture Workshops

Converting to Desert Landscaping
Introduction to Permaculture

Desert Ethnobotany Workshops

Saguaro Fruit Harvest
Summer Edibles

Natural Crafts Workshops

Elbow Basket
Pine Needle Basketry
Miniature Basketry
Melon Basket

Children's Workshops

A "Maize"-ing Corn
All About Cotton

Watch KTVK-TV3 for updates on night-blooming, early morning desert walks!



For more information, please call the Garden at 941-1225.

Refer to the Summer Calendar for a complete listing of classes and workshops.

Garden News



Spring plant sale.

KAET-TV Broadcast Boosted Spring Plant Sale

Let there be no doubt about the power of television! At the spring plant sale, KAET-TV (Channel 8) broadcast a live show, "Arizona Landscaping and Gardening" with the underwriting support of Salt River Project and the Environmental Protection Agency. Not only was the DBG the setting for this event, but we also provided plant experts for interviews including Robert Breunig, Liz Ecker, Patrick Quirk, Cesar Mazier and Mary Irish.

Mary, who was in charge of the spring sale, said the sale grossed over \$55,000 for the Garden, an "incredible success."

Look for the next installment of the "Arizona Landscaping and Gardening" program at the fall landscape sale which will be open October 18 to Garden members and October 19 and 20 for the general public. 🌵



DesertFest '91

Kids Can Get Summer Passport

Hey kids! If you want to visit other "worlds" this summer without leaving town, this is the ticket for you.

The Desert Botanical Garden, The Heard Museum, the Phoenix Art Museum and the Arizona Museum of Science and Technology are teaming up to bring you a **Passport to Valley Adventure**. This passport is a treasure map to fun and learning about our city's cultural heritage.

Just pick up your Passport at the Garden, or any of the museums listed above. When you visit each place, have your passport stamped. When you've seen all there is to see at each location, send in your completed Passport or drop it off at the last place you visit to be eligible to win family prizes including tickets to the Phoenix Suns and Cardinals, a balloon ride donated by Tatum Ranch and a weekend vacation at The Wigwam Resort.

All the museums have reduced the price of admission so you can visit as much as you'd like and bring your friends and family. The Passport will be available from Memorial Day through Labor Day, so don't miss this summer adventure! 🌵

Sales Greenhouse on Vacation

The sales greenhouse has closed for the summer. However, watch the back patio of the Gift Shop for plants. It will be kept stocked throughout the summer. The sales greenhouse will open again on Oct. 1, 1991. 🌵

Our Plants Need You!

Garden members know from a recent mailing that your support is needed to help our plants by means of the new Adopt-A-Plant program.

Designed to better acquaint members with a vast array of plants under the Garden's care, the program gives members the opportunity to adopt one or more plants on an annual basis. Contributions will provide for the ongoing care and maintenance of plants for a year.

So, pick out a plant that interests you and get involved with it! You'll help the Garden as well as your adoptee. Brochures are available at Admissions and in the Gift Shop, or by calling 941-1225. ☜

Help! New Mesquite Supplies Needed for Trail Exhibit

The Garden needs 1,000 gallons of mesquite beans to re-stock supplies on the *Plants and People of the Sonoran Desert* trail for the coming season.

Members have met this need for the past two years, said Ruth Greenhouse, exhibit coordinator. She said any species of mesquite is acceptable, but the pods need to be dry (to avoid spoilage) and free of debris. Collecting can begin this month.

Beans in any quantity may be delivered to the Admissions booth. Ruth asks donors to leave their names and addresses so their contributions can be acknowledged. This important service by members has maintained the mesquite pounding activity on the trail, one of the most popular features in the Garden. ☜

Garden Director Elected To Conservation Center Board

Robert Breunig, Executive Director of the Desert Botanical Garden, has been elected to the board of directors of the Center for Plant Conservation (CPC).

Founded in 1985, the CPC is a consortium of twenty botanical gardens and arboreta across the country charged with the mission of identifying, researching and rescuing plant species which have become rare or are in danger of extinction. Dr. Breunig's prestigious appointment marks a milestone for the Desert Botanical Garden in pursuing this mission and highlights the Garden's involvement in conservation of the fragile desert ecology.

With the construction of the new Fleischer Propagation Center at the DBG, capability to preserve these rare and endangered species has increased dramatically. The Garden is home to thirty plant species designated by the CPC as rare or endangered. Its geographic responsibility on behalf of the CPC is an area of the Southwest which includes the Sonoran Desert, southern New Mexico and west Texas. (See related article in the Spring, 1991 issue of *The Sonoran Quarterly*).

Breunig is one of only two botanical garden directors elected to the CPC board of directors which is composed of nineteen members. ☜

Yucca Plants Needed For Paint-Brush Activity

Leaves from native yucca plants — *Yucca elata* and *Yucca baccata* — are needed for making yucca paint brushes.

Ruth Greenhouse, exhibit coordinator, said DBG staff will arrange to pick up discarded or dead plants. Supplies are becoming rapidly depleted for the popular activity which allows Garden visitors to take home a souvenir they made themselves.

Don't waste this valuable resource on the garbage dump. Call Ruth at 941-1225 if you know of a yucca plant being discarded. ☜



In Print

By Jane B. Cole

The Official World Wildlife Fund Guide to Endangered Species of North America, V.1, edited by David W. Lowe, John R. Matthews, Charles J. Moseley; Washington: Beacham Publishing, Inc., 1990. \$85

Fighting words in Arizona are "Mt. Graham red squirrel." This endangered species is recognized, or at least its name is recognized, as a part of controversies about growth and development. *Tamiasciurus hudsonicus grahamensis*, the Mt. Graham red squirrel, was common in its range in the Pinaleno Mountains of southwest Arizona before 1920, but declined rapidly as a result of logging and by 1950 was considered rare. It is having trouble maintaining its old neighborhood not only because of loss of trees, but also because the introduced tassel-eared squirrel, *Sciurus aberti*, is a more adaptable, easy-going settler with less specialized requirements for life.

Read all about it in volume one of *The Official World Wildlife Fund Guide to Endangered Species of North America*. Here, we find that the Mt. Graham red squirrel was listed as "endangered" in June 1987, about the same time the University of Arizona was developing a conservation plan for the squirrel in order to build a complex of more than seventeen telescopes on major peaks in the Pinaleno Mountains. The book includes a picture of the squirrel, a map showing its habitat location, a description of actions taken to save the species from extinction and a short list of selected references. The bias of the World Wildlife Fund is obvious. It is definitely not a group of people interested in stargazing, but they do a good job of compiling a forthright report.

In addition to reports on each of the North American mammal species that are listed as endangered, this volume also treats flowering and non-flowering plants that are currently listed under the Endangered Species Act. Limited range, logging, construction and out-competition by introduced species are some hazards facing mammal populations and also threaten over three hundred listed-endangered plant species. Twelve plants in Arizona

are included: The Arizona Agave, Kearney's blue-star, Navajo sedge, Cochise pincushion cactus, Arizona cliffrose, Nichol's turk's head cactus, Arizona hedgehog cactus, Brady pincushion cactus, Peeble's Navajo cactus, Siler pincushion cactus, San Francisco Peaks groundsel and Tumamoc globerry.

The Arizona agave, *Agave arizonica*, is threatened in its natural habitat by illegal "collectors" and livestock grazing. In its natural habitat the Arizona agave grows in the New River Mountains north of Phoenix. It has been a project of the Desert Botanical Garden since the 1970's when it was discovered by Dr. Howard Gentry, then Garden research director, and has been listed endangered since May, 1984.

According to the information contained in volume one, *World Wildlife Guide*, each of us can choose an endangered ecosystem right here in Arizona and learn about it. Individual species are endangered, but all native species are needed. Read all about it. ☞

Jane B. Cole is librarian in the Richter Library at the Desert Botanical Garden. The library is open to the public by appointment (941-1225).

Joint Admission Program with Heard Museum a Huge Success

The Desert Botanical Garden and The Heard Museum have entered into a joint admission discount program. Garden visitors can tour The Heard at half-price with their Garden admission receipt and Heard visitors can visit the Garden under the same arrangement. Attractive signs announcing the program are displayed in the DBG gift shop and near the entrance at The Heard. We gratefully acknowledge Garden Trustee Betty Kitchell and her husband Sam for their generous donation that made these signs possible. ☞

Desert Detective

CASE NUMBER THREE

"The Case of the Sizzling Summer"
(A Self-Guiding Tour for Children for use at the
Desert Botanical Garden)

The Desert Detective Agency invites you to solve Sammy Saguaro's third desert mystery. You have been assigned to "The Case of the Sizzling Summer." The Agency has given you clues to help you learn about the plants and animals that live in the Desert Botanical Garden. The clues will also help you solve the puzzle. Good luck on your search!

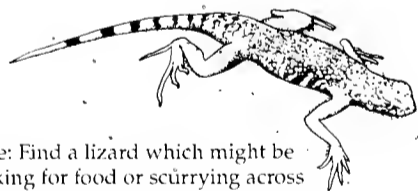


**Sammy Saguaro,
the "Super Sleuth"**

DIRECTIONS

1. Be sure to stay on the paths while looking for the answers to your puzzle.
2. Put a mark in each clue box as you discover an example of the clue. As you discover more examples of a clue, add more marks in your clue box.

Lizards spend most of their summer days looking for food, although they try to avoid the midday heat. They are able to run quickly across the hot ground which helps them stay cool.



Clue: Find a lizard which might be looking for food or scurrying across the ground or path to keep cool.



3. To find out what kind of detective you are, count the total number of marks in all your clue boxes.
4. What kind of DETECTIVE are you?
 - 5-10 marks = Desert Detective
 - 11-15 marks = Agave Ace
 - 16-20 marks = Cactus Captain
 - 21+ marks = Super Saguaro Sleuth

DESERT DETECTIVE CERTIFICATE: CASE NUMBER 3

_____ name

visited the Desert Botanical Garden on

_____ Date

and earned the title of

_____ Type of Detective

Most cacti produce fruit in the summer. Cactus fruits come in many different colors: red, purple, yellow, orange and green.



Clue: Find a cactus with at least three fruits on it.

Even though spring is the time of the year when most desert plants flower, you can find flowers in the desert during every season including summer.



Clue: Find a plant with white, yellow or purple flowers on it.

Many desert plants in the bean family produce bean pods in the summer. Some of the beans are eaten by desert animals. Others grow into new plants.



Clue: Find a bush or tree with bean pods hanging from the branches.

Some desert plants do their growing in the cooler months of winter and spring. During the dry, hot summer they shed their leaves and "rest" until the weather becomes cooler.



Clue: Find a bush that looks dead because it has shed its leaves for the summer.

Rain comes to our desert in late summer in the form of thunderstorms. This rain is very important for the plants and animals that live in the desert.



Clue: Look for large clouds on the horizon that might bring summer rains to the desert.

Birds love to eat juicy, seedy cactus fruit. Often they perch on the cactus and peck a hole into the large fruits.



Clue: Find a cactus fruit with a hole in it that may have been made by a bird eating the fruit.

Tall cacti often have fruit on the tips of their high branches.



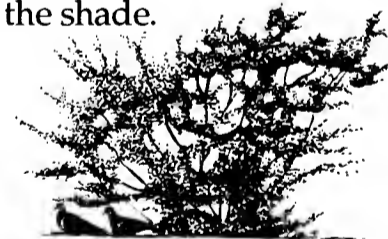
Clue: Find a very tall cactus with fruit on the tips of its branches.

The desert is full of interesting sounds in the summer. You may hear birds singing or insects buzzing.



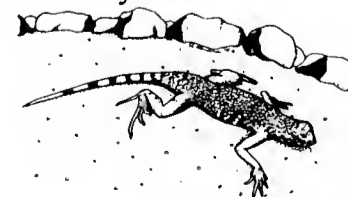
Clue: Listen carefully for the sound of a bird or an insect.

Shady areas under trees and bushes provide protection from the hot summer sun. Some desert plants only grow in shady areas. Many desert animals rest in the shade.



Clue: Find a shady place where a plant is growing or a bird, lizard or other animal is resting.

Lizards spend most of their summer days looking for food, although they try to avoid the midday heat. They are able to run quickly across the hot ground which helps them stay cool.



Clue: Find a lizard which might be looking for food or scurrying across the ground or path to keep cool.

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The Desert Botanical Garden wishes to acknowledge the support of all of its 6,300 members. Recognized in the Quarterly are members of the Saguaro Society, Agave Century Club, Desert Council, and donations received from Jan. 1, 1991, through March 31, 1991.

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If you have an item you believe would be useful, please call the Garden at 941-1225 for more information. And thanks for your generous response to last quarter's "Wish List"!

Four-drawer filing cabinet
Mesquite beans
5-1/4" diskette file
3-1/2" diskette file
20' and 50' tape measures
Portable cement mixer
Upright computer desk
Mesquite beans
Pushcart
Desk chair on casters
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Vacuum cleaner

Paper cutter
Electric stapler
Wall shelves
Ladders
Mesquite beans
Golf utility cart
1/2- or 3/4-ton tow pick-up
Hand tools
5-10 HP electric compressor
Heavy-duty dolly
100X microscope
Chain saw

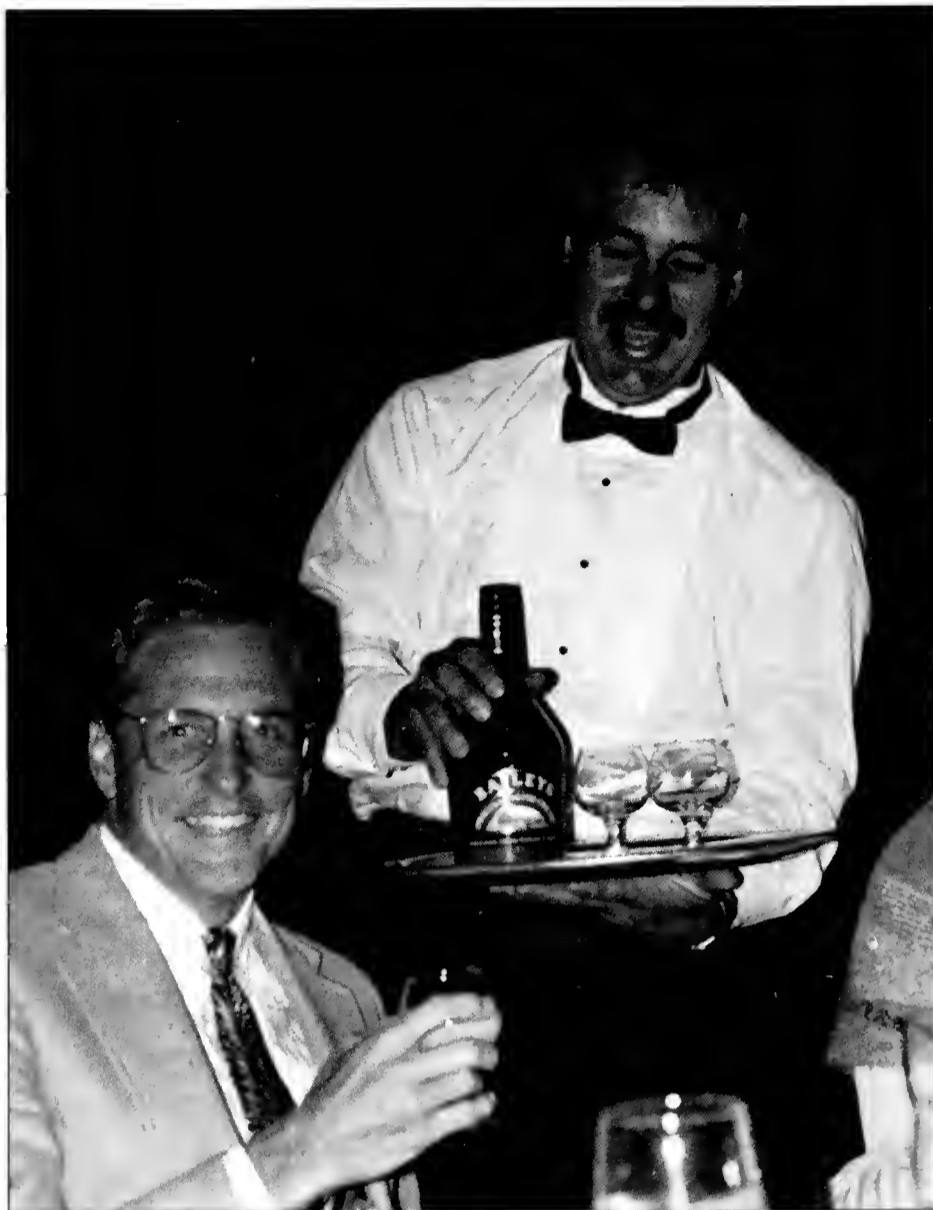


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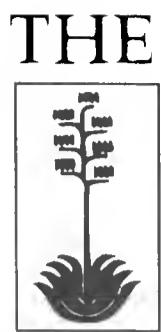
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THE SONORAN QUARTERLY

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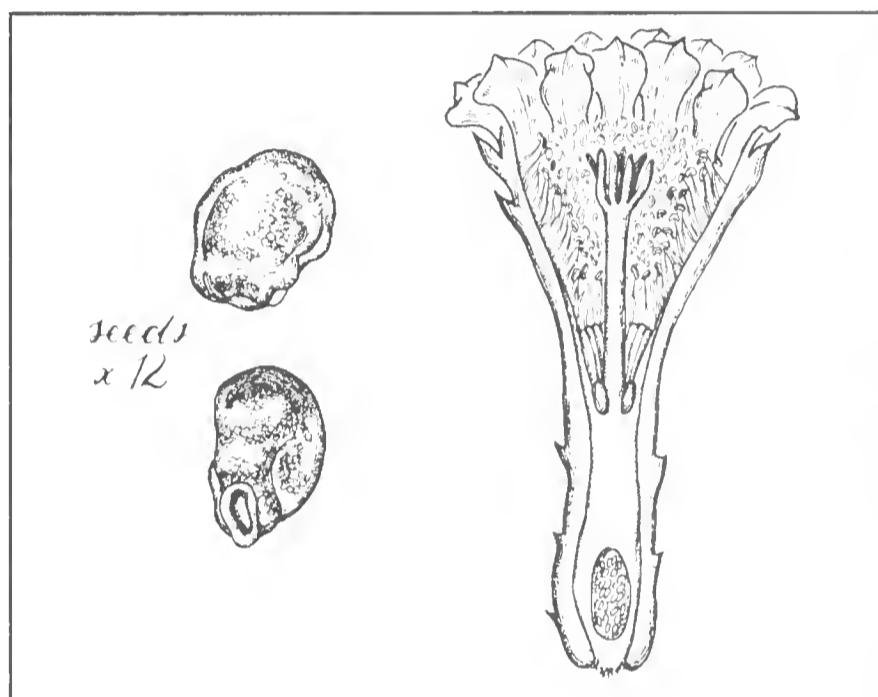


What Nature Knows Scientist Looks at Seeds, Sees Eons Of Life's Lessons in Code

By Dr. Gary P. Nabhan


Cupping my two hands together, I can hold a single seed of each plant that grows on the acres of desert lands where I live. Filling a bottlegourd canteen full with one seed from each genetically-distinct cultivated variety native to this continent, I could also carry around samples of all of the domesticated crop strains known to have existed prehistorically in North America.

When pooled together, these microcosms of life called germ plasm contain more information than is contained in the Library of Congress. In a handful of wild seeds taken from one natural community, there is hidden the distillation of millions of years of coevolution of plants and animals, of their coming together, coexisting, partitioning various resources, competing or becoming dependent upon one another. In a gourdful of crop seeds taken from fields of Native American farmers, we have the living reverberations of how past cultures selected plant characters that reflected their human sense of taste, color, proportion and fitness in a particular environment. We also have the



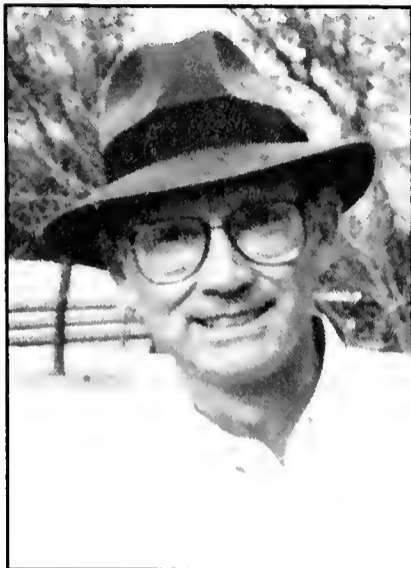
Botanical illustrations by Wendy C. Hodgson

germ that generates many stories, many ceremonies and many blessings.

Seeds. One might simply define them as fertilized, matured ovules, the results of sexual reproduction in plants. Usually, we think of seeds as the enclosed germ of flowering plants, but "naked" ovules such as those of conifers and cycads qualify as well. We tend to focus on the seeds of flowering plants — the angiosperms — because they make up more than half the food that humankind ingests every day. They are the pits of fruits, the grains, the nuts and the beans that have sustained us ever since we emerged as a species 200,000 - 500,000 years ago. Today, the fate of these angiosperms is in our hands more than ever before. 

From Enduring Seeds, by Gary Paul Nabhan. North Point Press: San Francisco, 1989. Reprinted by permission of the author.

Dr. Nabhan is Senior Research Associate at the Desert Botanical Garden.



By Robert Breunig,
Executive Director

As this is being written it is mid-summer. The monsoon rains have yet to come-they are late this year. I have just returned from a twilight walk through the Garden looking for late season night blooming cacti. Everywhere on the grounds are seeds. Thousands upon thousands of dry mesquite and palo verde seed pods crackle underfoot. The seeds await the animals that feed on them-or bury them for the future. And they await the rains that still must come. It must be the omnipresence of these seeds that has inspired this issue of *The Sonoran Quarterly*.

As you will see, we discuss seeds both literally and figuratively. Many people are not aware of our seed bank program in which we store the seeds of our rarest plants in perpetuity. Marjorie H. Roberts' article provides a good introduction to this program and facility. Throughout the summer, visitors have noticed fine-meshed nets over our agave flowers. This is part of a program to ensure the production of non-hybridized agave seeds for the future of our collection. And Carol Schatt describes the role of seeds in the botanical cycle.

Figurative seeds are being planted every day by the volunteers and teachers in

the Garden's education program. From concepts disseminated from the Garden each day, the seeds of understanding and respect for the desert are planted with the public. This program is highlighted in this issue.


This summer, the staff has been planting other kinds of figurative seeds. Each department is completing work on its five year plan. These plans are setting new goals and outlining ambitious programs for the Garden. A comprehensive five year plan will be presented to the board of trustees in the fall for discussion, refinement and (we hope) approval. And to stretch the seed analogy just a bit further, our trustees are planting their own seeds this summer. A new Planned Giving Committee of the board has been organized to look into ways to encourage friends and supporters to think about long term gifts to the Garden.

"From concepts disseminated from the Garden each day, the seeds of understanding and respect for the desert are planted with the public."

In future issues of *The Sonoran Quarterly* we will be describing various ways in which our members can support the Garden with planned gifts. We will call to your attention the Desert Botanical Garden Endowment Fund, which was started with a generous gift from the late Opal Oyaas and is growing under the careful management of our trustees. This Endowment Fund will provide for the future needs of the Garden. We will encourage you to consider a contribution to this endowment in your will. With these kinds of seeds, you can help ensure that the Garden continues to plant its own real and figurative seeds well into the future.



Special Pullout Calendar Enclosed for Your Convenience

With this issue of *The Sonoran Quarterly* we are pleased to inform you that the Quarterly Calendar listing of all classes, workshops, trail activities and other Garden events can now be found in a special pullout calendar section on page 12. Now it is possible for you to get a behind the scenes look at the Garden with *The Sonoran Quarterly* and an up-to-date listing of all our activities in one convenient place. If you have any questions or are having problems receiving your Membership publications, please contact the Community Relations Department at (602) 941-1225. Thank you. 

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Editor: Carol Schatt
Original Design: Moonlight Designs

Every Mind a Garden Education Staff Sows Seeds of Understanding

By Carol Schatt

Planting seeds is what the Garden's education department is all about. Not one of the four staff members may pick up a trowel during an entire week, but they are Johnny Appleseeds to thousands of Garden visitors.



Young "sleuths" enjoy a game of "Desert Detective."

They plant ideas and concepts about the desert within the minds of people who come to the Garden. They are fulfilling a basic mission of the Desert Botanical Garden and their work has a ripple effect in promoting greater understanding and sensitivity toward natural environments throughout the world.

"We try to teach people of all ages and all places the importance of the desert environment," said Kathleen Socolofsky, director of education. "And we're hopeful that in learning about one environment, they can understand more about the other environments of the world."

Assistant director of the education department is Pat Smith. Ruth Greenhouse is exhibits coordinator and Lynne Schilt is scheduling secretary.

"We are a museum with a living collection of desert plants. We believe that the collection has greater value when you teach people about it," said Kathleen.

A casual visitor to the Garden may think he or she is here for a pleasant morning stroll through an attractive and scenic location. The visitor may enjoy the sunshine, the comfortable temperatures, the sensory delights of garden sights, smells and sounds or may simply be in search of slight diversionary amusement.

But visitors are also moving targets for ideas. The education department has idea-launchers everywhere. "We teach in every way we can," said Kathleen, "from specially developed exhibits and signs to interpretive trail booklets and tours to hands-on demonstrations."

Another major audience toward which education programs are aimed is the school groups who come to the Garden in great numbers each year. About 19,000 students visited the Garden last year compared to 6,000 five years ago.

Kathleen's staff has a philosophy about programs designed for school children. "We don't believe they should come here and have our people just impart information to them. We don't believe in taking these children out of one indoor classroom, walking them down the path and into another indoor classroom.

"Instead, we want the Garden's living collection to be an alternative learning site where we encourage children to observe the natural environment and to participate in hands-on and research experiences. The

emphasis in science education is to teach in the real environment," she said.

"In order to meet their needs, we provide resource materials to the teachers," she said. These packets include information on how to design the self-guided field trip to the Garden, a desert study guide which teachers may use with the students before, during and after the trip, and "Desert Detective" discovery games for each child.

Instead of following a lecturer through the Garden, children use the "Desert Detective" to explore the Garden in search of examples of fascinating desert concepts.

Two themed treks through the Garden are available for school groups: the Plantimal Safari for pre-kindergarten through first grade and Treasures of the Desert for second through sixth grades. These environmental education workshops involve children in sensory activities which foster an appreciation for the desert environment.

In addition to programs for school groups making visits to the Garden, the education department has also designed desert puppet shows to visit children at their schools. Co-developed and performed by The Great Arizona Puppet Theater are "Hotel Saguaro" for kindergarten through second grades and "Seasons of the Desert" for grades three to five. These puppet shows spark the children's imaginations while introducing them to the basic concepts of desert ecology.

A third major audience the education department serves is the Phoenix community. "We want to involve people from the community so we can effect some sort of change - a better understanding of the environment, more appropriate landscaping, an enlightened awareness of the desert's cultural and natural heritage," Kathleen said.

Another vital segment of the community audience is the volunteer program at the Garden. "The remarkable volunteers here make it all possible," Kathleen said. "Without them our jobs would be much more difficult. They serve as extensions of the staff."

Volunteers, of which there are now over 300, are well trained first. They attend a Volunteer Core Course which includes fourteen sessions of three-and-a-half hours each, followed by up to 27 hours of specialized training. (See Garden News for information on an upcoming open house for prospective volunteers.)

"We want to involve people from the community to effect some sort of change-a better understanding of the environment, an enlightened awareness of the desert's cultural and natural heritage."

The mission to teach is a complicated one. "We must concentrate on being a community educational resource on the desert environment. In this way, we train others to carry the message. We want to teach visitors, parents, volunteers, teachers, school administrators and university professors so that they can share the important concepts with others.

We have to contradict many mistaken ideas about the desert," Kathleen said. "So if someone walks away from here and sees the desert as a good place, or that it was fun or beautiful here, we have succeeded." 3



Field Notes

6

DBG Research Team Studying Soil Preferences Of Rare Texas Native

By Carol Schatt

Amsonia tharpii, Texas blue star, is a herbaceous perennial which blooms with a small, blue flower in April and May. The plant, which previously was known from only one population of three hundred to five hundred plants in Pecos County, Texas, was designated just this year by the Center for Plant Conservation as a part of its national collection of rare and endangered plants.

Two years ago, Liz Ecker, DBG curator of collections, along with Wendy Hodgson, DBG research botanist and curator of the herbarium, and Jackie Poole, botanist for Texas State Parks, collected *A. tharpii* seed from its native habitat in Texas and noted that the plants grew in limestone soils with extremely high pH (alkaline) as well as very high calcium.

Plants were germinated successfully from those seeds at the Garden, but Liz noticed these plants consistently declined. Watching the symptoms and thinking about the characteristics of the limestone soils in which *A. tharpii* naturally occurred, the DBG research collection team (Liz, and Lynda Pritchett-Kozak, conservation research horticulturist) began to realize they were seeing symptoms of calcium deficiency in the seedlings.

Last May, Liz and Lynda (with the help of a grant from DBG Trustee Virginia Ullman) went with Bill Dunmire, a botanist with the New Mexico Nature Conservancy, to a new population of the plant he had

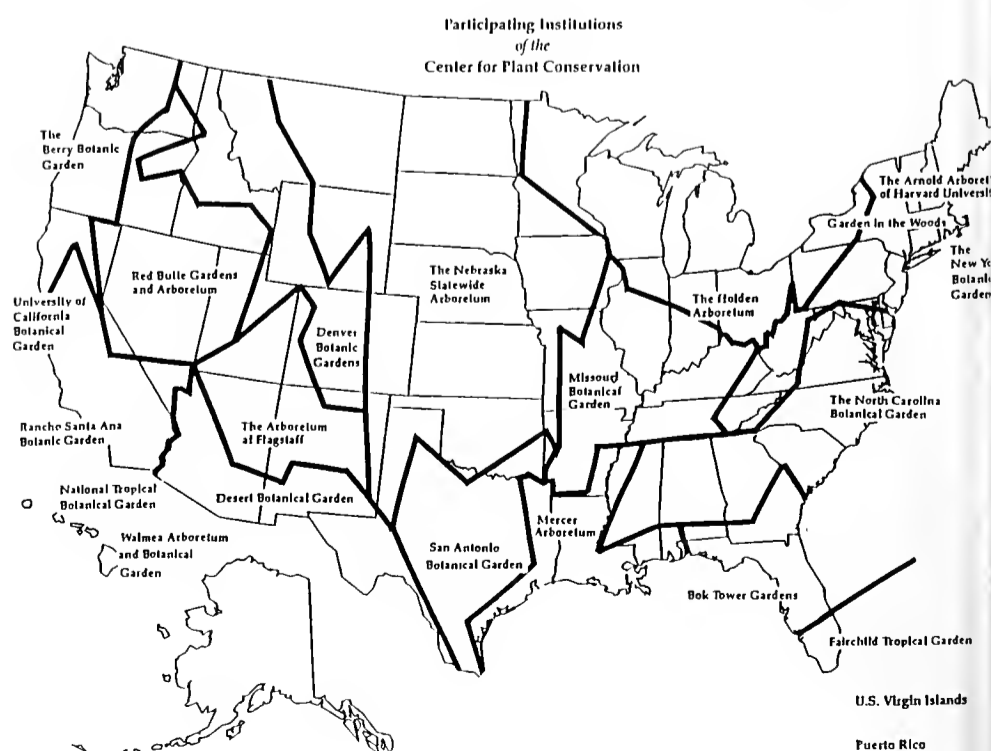
discovered last year near Carlsbad, New Mexico.

There they collected cuttings, a few plants and seeds from the previous year, the present crop not being mature enough for seed collection. Noticing the New Mexico soil to be remarkably similar to what *A. tharpii* was enjoying in Texas, they also brought home samples of soil.

In New Mexico the plants seemed to grow in a moderately disturbed site in proximity to a canyon. The plants were not found on the canyon tops, nor in the bottom, but where alluvial soil had collected as the limestone cliff eroded. The team also discovered that *A. tharpii* has a rhizomatous root structure, spreading roots adapted to withstand soil disturbance.

Suspecting by now that *A. tharpii* is a lover of large amounts of calcium, scientists have begun soil experiments at the Garden using a native soil component with added limestone to provide extra calcium. These seedlings are looking better and responding well to this calcium-enriched soil.

Experiments will continue to study how to grow this CPC-designated plant. 8



The Seed Room: A Bridge in Time For Genetic Diversity

By Marjorie H. Roberts

The room is simply labeled: SEED ROOM. The doors are always closed. Furnishings are sparse and utilitarian - a freezer, metal shelves, a work table and chair, a filing cabinet, a refrigerator. On the shelves are jars, tin boxes, coffee cans, film canisters. There is no dust, no dirt. An outer room is even more plain-a workroom with a desk and chair.

This is the seed bank in the Fleischer Propagation Center, a high priority spot where the Garden stores seeds from its collection and from plants designated in the Center for Plant Conservation program.

Seeds from rare and endangered species are the prime focus of this storage facility, although other seeds collected on the grounds are also kept there, including wildflower and vegetable seeds for next year's beds.

"The purpose of the seed room is to store and conserve seeds and pollen, particularly from rare or endangered plants, and to have seeds which represent the genetic diversity of particular species," said Liz Ecker, curator of collections at the DBG.

Seeds are prepared carefully for storage. After being cleaned of extraneous chaff and dirt, they are packaged and then placed in a drying chamber with silica gel and a hygrometer, a device which measures humidity. There, the humidity of the seeds is reduced to three or four percent. Then they are sealed in foil-lined, airtight outer

packages and placed in the freezer at -10 to -20 degrees Celsius. The packages are labeled with botanical names and accession numbers. Detailed data about the seeds, such as where they were gathered and when is placed in the Garden's computerized plant-tracking system by Plant Registrar Starr Urbatsch.

"The purpose of the seed room is to store and conserve seeds and pollen and to have seeds which represent the genetic diversity of particular species."

"Seed frozen with low humidity and low oxygen can be kept a long time," Liz said. "If the seeds are not dried, whether in a freezer or on a shelf, they lose their viability and die much sooner than dried seed," she said. While most seeds stored at the Garden are kept on shelves, those of highest priority are dried and frozen. The temperature of the freezer is monitored daily to ensure the safety of the seed collection.

Scientists believe seeds preserved this way are viable indefinitely. Seeds have been stored at the Garden in this manner as long as six years, Liz said. All seeds here are tested for germination every two or three years.

Plant pollen is also frozen and stored, but the process differs slightly from that for seed preservation. Fresh pollen is collected early in the morning and dried in a container filled with silica gel in the refrigerator for 24 hours. Pollen loses viability quickly at room temperature and therefore must be dried in the cool temperature of the refrigerator. The rest of the storage process for pollen is similar to that used for seeds.


Visitors to the Garden this summer observed what appeared to be baggies over

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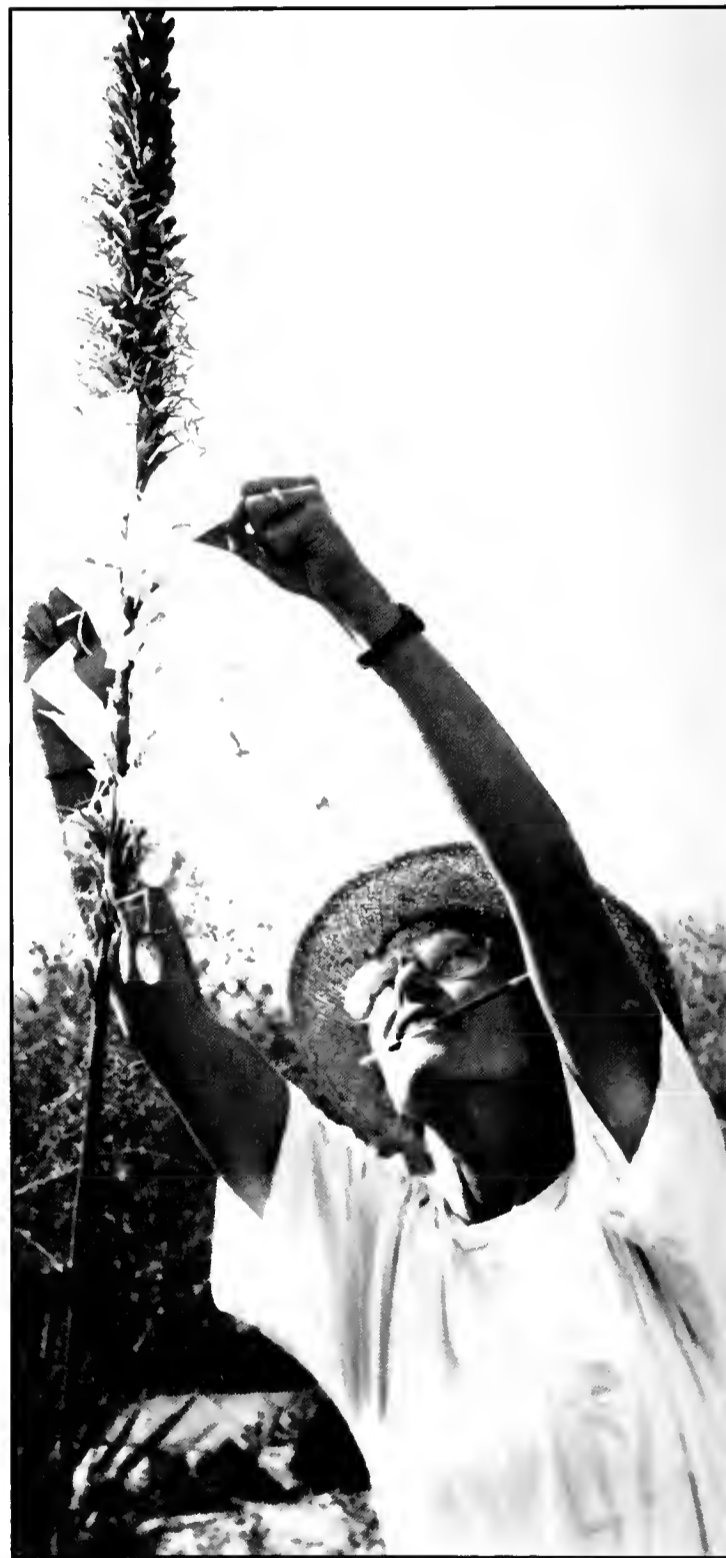
some agave blossoms. These actually were glycine bags (which allow for air exchange) placed there by Lynda Pritchett-Kozak, research horticulturist who is in charge of the seed bank. Lynda "exclosed" the agave flowers using the glycine bags so she could control what pollen was deposited on the flowers and perform hand pollination. This procedure is particularly important with the agaves at the Garden, which tend to hybridize easily because so many species are present and bloom occurs at the same time.

An agave blooms just once in its lifetime. If only a limited number of individuals in a species are present and they happen not to flower in the same year, cross-pollination within that species cannot occur unless pollen can be saved from one year to pollinate blossoms in another year. By using previously collected and frozen pollen, Liz and Lynda are able to produce viable and non-hybridized seed from the agaves here, thereby ensuring that those species will continue to be represented in the Garden collection.

"The work in the seed bank is vital to maintaining viable seeds for scientific research—to learn how these plants grow, to preserve the collection and to back up seeds of endangered species," Liz said. 

Marjorie Roberts, a freelance writer, is a volunteer at the Garden.

The Desert Botanical Garden has a research seed exchange program with over 248 institutions in 43 countries throughout the world. Universities, botanical gardens and natural history museums are represented from Veracruz, Mexico to the Bay of Bengal in India.



Lynda Pritchett-Kozak, research horticulturist at work with Garden agaves.

Someone to Know

Director of Education Sees The Garden as Classroom

By Carol Schatt



*Kathleen
Socolofsky, Director
of Education*

It was six years ago when Kathleen Socolofsky started work at the Desert Botanical Garden as director of the education department. Her job, to develop the Garden's education programs and manage the Garden's 300 volunteers, means that she is involved with every visitor or volunteer at the Garden.

One important component of the Garden's mission, she feels, is to educate people about the ecology of the desert and, hopefully, to erase the myths and misconceptions they hold about the desert environment. She views the Garden itself as an outdoor classroom for teaching the fundamental concepts of desert ecology.

With a B.A. degree in education from Louisiana State University, where her father is a microbiologist, Kathleen taught third and fifth grades in Houston for five years. During that time she helped develop a pilot program for gifted and talented children in the Spring Branch Independent School District.

"That was really exciting," she said. "Gifted education programs are on the cutting edge because of the innovative methods they employ to educate people."

Her path eventually led from Houston to Phoenix. "There are so many people here that I learn from- researchers, horticulturists, others. I enjoy working with specialists to translate what they know into forms the visitors can understand."

Among her "translations" here, Kathleen has:

- *Written the Sonoran Desert Handbook, Desert Detective and other educational materials for visiting school groups;
- *Co-developed the Puppet Show Outreach Program with The Great Arizona Puppet Theater;
- *Developed DBG interpretive programs including hands-on trail activities and the touch-cart program;
- *Developed the volunteer core course to train volunteers;
- *Helped re-structure the volunteer program to focus efforts more effectively toward meeting the goals of the Garden.

Active in the museum community in Arizona, Kathleen co-founded the Museum Educators of Central Arizona and has served as its president. She is vice-president of the Museum Association of Arizona and was a field reviewer for the Institute of Museum Services 1990 General Operating Support grants. She served on the science/health textbook adoption committee for the Arizona State Department of Education.

Kathleen has recently been asked to serve on a State Board of Education task force to develop environmental education program guidelines for local school districts.

A Short Course on Seeds

By Carol Schatt

A seed is a miniature, living plant, a tiny root and shoot surrounded by an envelope of tissue. Many seeds also contain an endosperm, which is used during germination as energy.

Enclosing the seed is a seed coat, which may be soft, gelatinous, or hairy-but most often is hard.

Germination

The seed begins to grow when water enters the seed coat and the shrunken cells begin to swell. The seed coat then becomes permeable to oxygen and carbon dioxide. It may rupture, allowing for water and gas uptake and the emergence of growing points.

Water activates the seed's enzyme systems which go to work turning stored energy into new plant cells. The embryonic plant becomes larger.

Finally the seedling sprouts; usually the root structure is the first portion to emerge from the seed coat.

Dormancy and viability

A seed remains dormant because of several things: the embryo is immature; the fruit has not ripened; the seed coat is hard and intact; water and oxygen cannot pass through the seed coat or inhibitory substances are present.

"Breaking dormancy" is a term which reflects the forceful nature of the disruption to a seed's resting state. Temperature may control a seed's dormancy (it will germinate

only at the proper time of year) or moisture may be the factor (rainfall triggers germination). Some types of seedlings, once established, will induce dormancy in remaining seeds, thereby reducing competition; other seeds have an innate control which causes a portion of the seeds to remain dormant even though growing conditions are optimal. All these mechanisms operate to combine germination with successful growth so that nature's seed bank is not depleted.

Seeds remain viable for different lengths of time. Scientists have germinated seeds of the Indian lotus (*Nelumbo nucifera*), found in a drained lake bed in Manchuria which were radiocarbon-dated at 1,000 years old. On the other hand, *Acer saccharinum* (Sugar Maple) seeds last only a few weeks.

"All these mechanisms operate to combine germination with successful growth so that nature's seed band is not depleted."

Seed dispersal

Seed dispersal in plants is rich in detail, and idiosyncratic.

Seeds may have wings or plumes or be woolly in order to be blown by the wind. They may be so tiny as to qualify as windblown "seed dust."

They may have air spaces and be light in weight for bouyancy and be impermeable to water in order to float on streams or be pushed along by rainfall.



Photo by Carol Schatt

Seeds may be contained in fleshy fruits attractive to animals, or they may take the form of nuts which can be buried.

Their seed coats may have spines, hooks or barbs to cling to feathers or fur. They may have a sticky gelatinous substance in order to hitch a ride on a moving object.

Pods may be programmed to burst open and scatter the seeds when touched, or the flower stalk may be springy enough to spray seeds when the wind blows it.

Even dormancy itself can be considered a mechanism to distribute seeds through time.

Birds distribute seeds in various ways. Although sometimes the seeds are destroyed by being eaten, in other cases they pass unharmed through the bird's digestive tract. Birds also drop seeds while flying with them in their mouths. Some types of seeds are released when birds eat away the fleshy fruit. Red is the predominant color of fruit to attract birds.

Ants are major distributors of seeds, carrying them sometimes over great distances to their underground storerooms.

In general, shrubs, climbing plants and small trees use fruit to disperse their seeds. Small herbaceous plants rely on dispersal by wind or rain, and tall trees use wind or mammals to transport their seeds.

The seed, product of flowers, cleverly packaged and wittily launched, is what gave evolutionary success to the angiosperms, the flowering plants. And it is this evolutionary success that has allowed the flowering plants to outlive many less successful forms of life. *8*



Think Spring and Plant Wildflower Garden Soon

By Mary F. Irish

The very word "wildflower" is evocative. It brings to mind a glimpse of unexpected color on a rocky hillside, a meadow protected by fir-covered slopes or pale pastel streaks through car windows on a road through the desert. Though the name designates them wild, these exquisite flowers can provide some of the most wonderful color in the garden, and with surprising ease.

The term wildflower typically refers to herbaceous (meaning not woody) plants which bloom all at once in one season of the year. Most so-called wildflowers are annuals, but there are some exceptions, such as penstemon, which also go by this title. There are even a few, like desert marigold, which bloom virtually all year long.

Plant wildflowers in mid- to late October for spring bloom. You can plant as late as the end of November but the later you plant, the more you risk seedlings coming up too late, missing the winter rains, or being too small when spring weather turns warm. There is a spring planting season in March for summer wildflowers.

The first step in creating a wildflower garden, or adding wildflowers to an existing garden is soil preparation. Wildflowers grow in very poor soils as a general rule, and need very little amendment of the soil. Begin soil preparation by turning or raking the soil to a depth of about three inches. Add a thin layer of compost or fine mulch to the area to be sown.



Photo by Carl Mohr

Run a heavy-duty rake over the bed to work in the mulch and then go over the entire area again, in a perpendicular direction, to the same depth. Continue this raking procedure until all the mulch is incorporated into the bed.

How you plant depends on what you want to achieve. The bed will look most natural if the seed is broadcast over the entire area. Whether you are planting a mix or a single species, broadcasting seed can be made easier by mixing it with sand. To do this, combine fine, dry sand in a jar with the seed, shake well, then spread as evenly as possible over the prepared bed.

Again, with a heavy rake, scratch the seed in by moving the rake first in one direction, then in another.

It is usually advisable to cover the bed with material which will deter birds. Birds are extremely fond of both turned dirt and fresh seeds conveniently placed close to the surface. Bird netting can be used, but other covering such as leaves or shredded palm fronds also will work. If you use something other than netting, move it every day to see if the seed has germinated, and remove it as soon as the plants emerge.

Once the covering is in place, water the entire bed with a fine, gentle spray. Water every day until you see small plants emerging. Pay careful attention to the seedlings and do not let them dry out. How often you water will depend upon the temperature. When plants have four or five true leaves, a deep watering once a week should be sufficient. Very high temperatures may necessitate watering twice a week.

Usually it is not necessary to water wildflowers after about six weeks of growth. By this time the plants are well established and the weather has cooled. If the winter rains are adequate there is no need to water the wildflowers. However, if there is no rain for thirty days or the plants begin to look brown and stressed, water them.

There is generally no need to fertilize a wildflower garden beyond the addition of mulch at planting. Too much fertilizer can burn the delicate seedlings or may result in excessive vegetative growth at the expense of flowering.

When wildflowers have finished their bloom, allow the flower stalks to dry completely. Cut them off low to the ground and save the seed in a paper sack or other container that permits air passage. Once the

seed is completely dried, clean it by removing all the chaff, and store in a cool, dry place. This seed can be used to replant the garden next fall.

Many wildflowers reseed themselves freely, others are more reluctant. Therefore, it is wise to save seed of anything which you particularly want to have next year, or if you are uncertain of its self-seeding success. Watch your garden - that is after all most of the fun in doing this - for those flowers which come up and take over the garden. You won't need to save seed from these, but others you will have to encourage.

Don't be afraid to weed out too many plants. In general, wildflowers will do better if they are not extremely crowded when they are very small.

A wildflower display is one of the finest rewards of gardening in the desert. Start a wildflower garden this fall and bring the desert spring to your own backyard. *g*



Photo by Dick George

Wildflower Seed List

Look for seed at the sales greenhouse, the gift shop, and the fall landscape sale. These are the most commonly available seeds.

<i>Baileya multiradiata</i>	desert marigold
<i>Cassia covesii</i>	desert senna
<i>Castilleja chromosa</i>	desert Indian paintbrush
<i>Cucurbita digitata</i>	coyote gourd
<i>Cucurbita foetidissima</i>	buffalo gourd
<i>Dyssodia pentachaeta</i>	golden dyssodia
<i>Eschscholtzia mexicana</i>	Mexican goldpoppy
<i>Kallstroemia grandiflora</i>	Arizona-caltrop
<i>Lesquerella gordonii</i>	bladderpod
<i>Lupinus sparsiflorus</i>	desert lupine
<i>Oenothera speciosa</i>	evening primrose
<i>Penstemon eatonii</i>	firecracker penstemon
<i>Penstemon parryi</i>	desert penstemon
<i>Phacelia campanularia</i>	desert bluebells
<i>Proboscidea parviflora</i>	devil's claw
<i>Salvia columbariae</i>	desert chia
<i>Salvia tiliaefolia</i>	chia
<i>Senna covesii</i>	desert senna
<i>Verbena gooddingii</i>	desert verbena



This Hearty Addition Is Adapted to Desert

Dalea pulchra
Bush dalea

By Mary F. Irish

Here in the desert, gardeners are always on the lookout for attractive plants which thrive in the high heat, poor soils and low rainfall regime of our area. One plant which offers excellent tolerance for the conditions of the desert southwest, and great beauty is bush dalea, *Dalea pulchra*.

Bush dalea is a native of the Sonoran Desert region of southern Arizona and Mexico. Although not a widespread species, it is locally common in certain mountain ranges of southern Arizona and northern Sonora. It is most common at elevations between 3,000 to 4,000 feet.

Bush dalea is a medium-sized shrub, three to five feet tall, with small silvery-grey compound leaves. The leaves are covered with fine soft hairs, giving the plant a light, velvety appearance. The shrub is more or less evergreen, and is drought-deciduous in nature. In the garden, with only moderate watering, the plant will remain evergreen.

Cold tolerant in the low desert, plants in Phoenix show no cold damage and plants in Tucson show no damage to 10 degrees Fahrenheit.

In cultivation, bush dalea blooms profusely from March to May with small flowers set in tight clusters arrayed on a loose spike. The flower is surrounded by bristly bracts, giving the overall effect of a fine lavender ball embedded with rosy purple flowers.

Bush dalea can be planted in fall or spring, but fall is preferable. The plant does best in full sun. New plants should be kept amply watered until established but an established plant will thrive on modest amounts of supplemental watering, about once every two weeks during the summer in the Valley. It is advisable to fertilize the plant infrequently. Bush dalea is not known to be susceptible to any diseases or pests.

Used in the garden as a background or filler shrub, bush dalea is particularly effective when surrounded by smaller plants which will be more visually assertive when *D. pulchra* is out of bloom. The silvery foliage makes a fine backdrop for other desert plants such as desert marigold, penstemon, or its close relative, trailing smokebush (*Dalea greggii*).

Bush dalea is another example of the beautiful native plants found in the desert southwest. If you are not already familiar with this plant, it will be an exciting addition to your garden. ⌘

Fiery Fuchsia Blooms Extend Color Season, Delight Hummingbirds

Zauschneria californica
California fuchsia

By Mary F. Irish

Looking around the Garden is always a pleasure, but in the fall when you come down the steps of Webster Auditorium, you meet one of the most astounding displays in the core garden. An entire bed of fiery orange-red blossoms beckons even the most seasoned

plant lover. This small but powerful bloom comes from the California fuchsia, *Zauschneria californica*.

California fuchsia ranges from southern Oregon to northern Baja California. Occurring in two forms, California fuchsia can tolerate a great range of conditions. The typical species is found on arid slopes and washes especially in southern California and Baja. The subspecies *latifolia*, which is what commonly is grown in horticulture, extends from Oregon to California, a resident of the hillsides and rocky slopes of moist canyons. Found from 2,500 to 7,000 feet naturally, the plant is very cold hardy.

In the garden the most desirable feature of the plant is its bloom. Blooms are tubular, orange-red, and occur along the length of the plant. Hummingbirds are drawn to them. Bloom begins anytime in the late summer and continues through the fall. This makes the plant a terrific choice to extend the season of color in the home yard.

California fuchsia can be planted from small containers in fall or spring, but fall plantings become established more easily. The plants grow vigorously and older ones benefit greatly from severe pruning after the last freeze. At the Garden, we regularly chop down the California fuchsia in late February.

California fuchsia does best in light filtered shade, but will tolerate full sun. Plants need good steady water to become established, and regular watering should continue throughout the year. The plants do not appear to have any particular pest or disease problems.

Here in the desert southwest we rarely see the brilliant oranges, reds and yellows of fall. But our own special fall color can be had with the use of *Zauschneria californica*. ⌘

Puppeteers Take Desert Message to Schoolrooms

The Desert Botanical Garden is taking the message of desert ecology to thousands of Valley school children through a puppet theater program launched four years ago.

The program, the first of its kind for the Garden, is a joint venture between the Garden and The Great Arizona Puppet Theater with partial funding by Phelps Dodge Corporation. It began when Nancy Smith, co-founder of The Great Arizona Puppet Theater, came to discuss a possible project with Kathleen Socolofsky, DBG director of education. "We were so excited about the possibilities," said Kathleen. "We began to develop 'Hotel Saguaro' and went on from there."

"Hotel Saguaro" highlights the saguaro as the center of an ecological picture -- a hotel for desert animals. Designed for children in kindergarten through second grade, it combines a puppet show with demonstrations and questions and answers about saguaros, in a one-hour presentation.

A second puppet show, for children in grades three to five, has been designed for older children and includes lots of audience participation. "Seasons of the Desert" features the mesquite tree and its importance in each season and through time. This show also consists of a half-hour puppet show followed by demonstrations and a group discussion.

Both shows visit classrooms free of charge to the school. Audiences are limited to 60 people and The Great Arizona Puppet Theater will perform up to four shows at one location. Performances will be booked to fill the available dates or until funding for the

program, which is through grants and donations, is exhausted. Information on funding is available through the development office at the Garden.

See the fall calendar for dates and times of these entertaining and educational Puppet Shows. *8*



*The Great Arizona Puppet Theater performs "Hotel Saguaro."
Photo by Bob Rink.*

To make reservations for "Hotel Saguaro" at the Desert Botanical Garden Weekend at The Great Arizona Puppet Theater, 3826 N. Third Street, Phoenix:

Call the DBG (941-1225) to obtain a coupon good for \$1 off the theater admission. Each child attending a weekend show will receive a free pass to the Garden.

To attend "Hotel Saguaro" and other Sunday afternoon puppet shows at the Garden:
No reservations are needed; these shows are free with admission to the Garden.



Garden News

Garden Members Elect New Trustees to Serve on Board



*Rosellen C. Papp,
President
Desert Botanical
Garden Board of
Trustees*

Rosellen Papp, a Desert Botanical Garden trustee since 1988 was elected president of the Garden's board of trustees at the annual members' meeting held May 23.

In addition to Papp's election, nine board members were elected to serve for the coming year. They are: Ronald Azzolina, president and CEO of Security Pacific Bank; Dwayne L. Burton; Bernadette de Angelis, manager of the Trust and Employee Benefit Administration Division at Northern Trust Bank; Pamela Grant, owner of Tablesapes; William Huizingh, Ph.D., retired professor and administrator; Martin Ohab, corporate personnel manager at Motorola; John Sack, Ph.D., senior vice president and director of marketing/planning at First Interstate Bank; Diana M. Smith, owner and publisher of Scottsdale Airpark News; and, David S. "Sid" Wilson. }

Gift-Shop Shelves Are Well-Stocked For Desert Readers

Readers of natural history are pleasantly surprised on their first visit to the DBG gift shop to discover an extensive assortment of books on desert subjects.

"People are beginning to realize we are a wonderful source for books about Arizona and desert topics," said Mary Ann Fox, manager of the gift shop the past four years.

She pointed out cactus "primers" -- the big basics of desert botany which include Benson's *The Cacti of the United States and Canada*, Britton and Rose's *The Cactaceae*, Kearney and Peebles' *Arizona Flora*, and others as well as a wonderful ethnobotany collection including works by Dr. Gary P. Nabhan.

Other horticultural favorites include Erik Haustein's *The Cactus Handbook*, George Miller's *Landscaping with Native Plants of Texas and the Southwest* as well as *Arizona Highways Presents Desert Wildflowers*, by the staff of the DBG, and a four-book series on cacti, wildflowers and birds published by Southwestern Parks and Monuments Association of Tucson.

Food-lovers will find books with native flavors: *American Indian Food and Lore* and *The Tumbleweed Gourmet*, both by Carolyn Niethammer, and *Desert Harvest, A Guide to Vegetable Gardening in Arid Lands*, published by Meals for Millions/Freedom from Hunger Foundation.

Mary Ann can special-order most books. "In the winter we order every week," she said. "The books usually arrive in the next week. If you don't see what you want, just ask and we'll do our best to get it."

Visit the DBG Gift Shop and find a book for your favorite desert reader. }

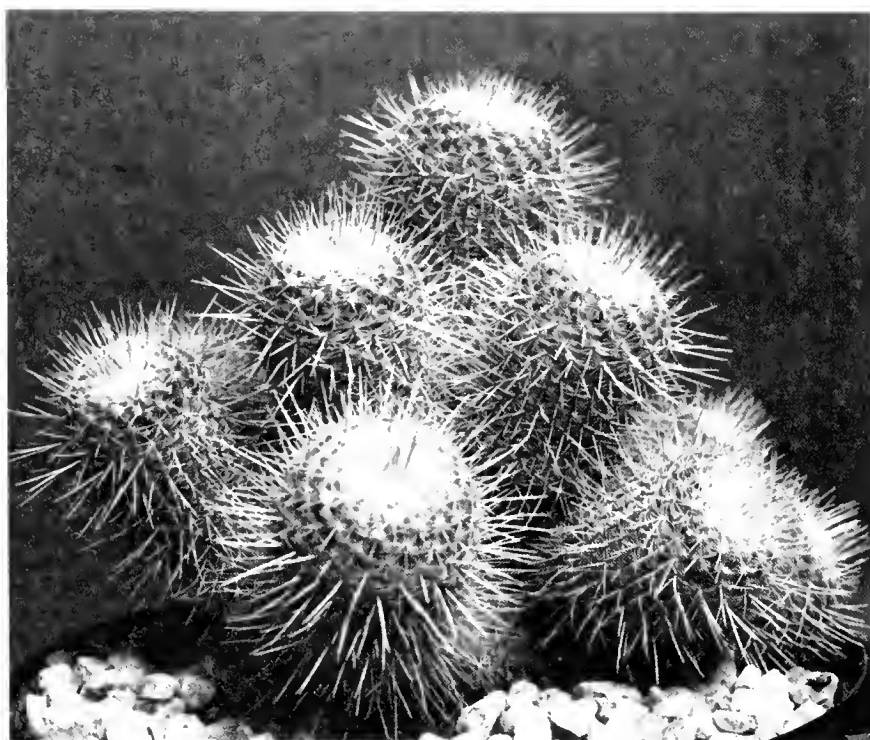


Photo by W.H. Earle

Sales Greenhouse to Open Oct.1 for Winter Season

The Sales Greenhouse will open for its fourth season on Oct. 1, well-stocked with a wide variety of cacti and succulents.

"We'll have hundreds of kinds of plants," said Mary Irish, manager of the Sales Greenhouse. "We try to have as large a variety as possible, and we always stock some old favorites such as golden barrel cacti, hedgehog cacti, and lithops."

Most of the specimens will be small, ranging from two-inch pots up through eight-inch ones, although more plants of larger sizes will be available through the year, she said. "We raise about ten percent of our sale plants here and the others come from Arizona growers," she said.

The greenhouse will be open from 10 a.m. to 2 p.m., Mondays through Fridays, and from 10 a.m. to 4 p.m. on Saturdays and Sundays until May 31, 1992. }

September Open House to Launch New Group of Volunteers

One volunteer began at the Garden because her garden at home in this new climate kept dying. "I wanted to garden where things were growing well!" she said.

Another Valley newcomer had found it difficult to meet people and make new friends until she became a volunteer in the Garden's friendly and well-structured program.

There may be as many reasons to become a DBG volunteer as there are volunteers, but most of them have to do with a love of gardening, the desert, and other people.

The Garden's volunteer program is based on the philosophy of greeting new volunteers, teaching them about the desert and the jobs they will be doing, and then putting them to work on a regular basis. Training opportunities range from a three-hour General Orientation to a comprehensive desert ecology course. Graduates of this Volunteer Core Course may serve as horticulture aides, docents, ranger aides, sales greenhouse and gift shop volunteers. Volunteers attending the General Orientation and specialized training classes may serve as facilities volunteers, T.O.P.S. (Temporary Office Persons) and special projects volunteers after they have completed the appropriate specialized training classes.

An open house for prospective volunteers will be held at 9:30 a.m. on Sept. 30 in Webster Auditorium. Persons interested should call 941-1225 in advance for an invitation.

Live Television Broadcast To Highlight Fall Landscape Sale

The Desert Botanical Garden will again be the "star of the show" this fall as KAET-TV Channel 8 returns to broadcast live from the Garden's Fall Landscape Sale, Saturday, October 19, from 9 a.m. until noon.

The sale will be open to the public Oct. 19 and 20 from 9 a.m. to 5 p.m. A preview sale for Garden members only will be Oct. 18, from 3 to 6 p.m. Individual members please note that your guests will not be admitted to the Members Only Preview.



Miniature desert gardener enjoys the Garden plant sale.

The plant sale will offer some 15,000 plants of about 280 different kinds, including some species new to horticulture, said Mary Irish, who is in charge of plant sales at the Garden. 8

Luminaria Tickets Available to Garden Members Earlier

Due to the overwhelming popularity of the Garden's holiday event, *Noches de las Luminarias*, Garden members have found it more difficult every year to enjoy this event without pressing crowds and long lines. This year, there will be a few minor changes in ticketing to ensure that the event retains its charm, unique character and intimacy.

From the time they receive this issue of *The Sonoran Quarterly* until November 1, 1991 (when *Luminaria* tickets go on sale to the public at Dillards) Garden members may obtain free tickets to any of the three evenings as well as purchase guest tickets. **That gives Members a two-month preview time in which to order tickets.** Tickets will be available by mail with the form on the back of *The Sonoran Quarterly*, at the Garden or can be ordered by phone at (602) 941-1225.

Noches de las Luminarias will be held December 5-7. Thursday, December 5, has been designated Members' Night and will be limited to ensure the event remains special. Members may come free of charge on any of the three nights and guest tickets may be purchased. However, each membership entitles the holder to purchase only *four* guest tickets for the Members' Night.

Remember, each Member must have a ticket to attend *Luminaria*. Free Members' tickets for any *Luminaria* evening can be obtained up until November 1, by using the enclosed form, coming to the Garden or ordering tickets by phone. Guest tickets may be purchased for any night but each membership entitles the holder to only *four* guest tickets for December 5, Members' Night. 8



In Print

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By Jane B. Cole

A Selection of Seed Sources:

J.L. Hudson, Seedsman, P.O. Box 1058, Redwood City, California 94064; *Native Seeds/SEARCH*, 2509 N. Campbell Avenue #325, Tucson, Arizona 85719; *Plants of the Southwest*, 930 Baca Street, Santa Fe, New Mexico 87501; *Southwestern Native Seeds*, Box 50503, Tucson, Arizona 85719; *Wild Seed*, 2073 East ASU Circle, Tempe, Arizona 85254.

It takes a real garden philosopher to get into the seed business. The copy in these catalogs is only partly designed to help sell the seeds. It also sells the point of view of the seed dealer or the non-profit source. They sell wildflower seeds, vegetable seeds and other naturally produced seeds either farm grown or wild gathered.

The line drawings that illustrate *Southwestern Native Seeds* are life size and accurate. Over 300 seed species are listed and include trees, shrubs, wildflowers and succulents. Not all are suitable for growing in the Sonoran Desert, but the catalog lists that information as well. Seeds are \$1.75 a packet plus \$1.00 postage.

Plants of the Southwest is chatty and includes tidbits of planting and harvesting lore. There are recipes for things like "stuffed fried squash blossoms" and suggestions on what to plant to attract wildlife.


Native Seeds/SEARCH has a well designed catalog ("seedlisting") with delightful artwork by April Baisan. The seeds here are for food crops, but beans, devil's claw, desert chia, mint marigold and sunflowers can also be used as ornamentals. All traditional domesticated crops, their seed packets are \$1.25 and are sold at the Garden.

Best catalog, most entertaining, most informative, most persistent (they've been selling seed since 1911) has to be *J.L. Hudson*. His seed packets are \$1.00 each in most cases and postage charges are \$1.00 for the first five packets and then various additional charges.

Each plant is named, the pronunciation is given, and then a complete description. Hudson's plants are not all native to the Americas but are all open pollinated, meaning that "bees, wind and the agencies of nature are allowed to pollinate the flowers, rather than by emasculating the flowers and applying pollen by hand."

Hudson, like *Southwestern Native Seeds*, makes a statement about endangered species: "I exercise due caution and judgment when purchasing these seeds to insure that they are from cultivated specimens or collected in accordance with the Endangered Species Act and C.I.T.E.S. (Convention on International Trade in Endangered Species)." Two full pages in his catalog give information about sowing seed and treating tough-to-germinate seeds. Some of the seeds are not appropriate for the Sonoran Desert and won't grow well here.

Nicely designed, but really just a list, is *Wild Seed*. This is the seed that is available at the Desert Botanical Garden in the gift shop and also in the sales greenhouse. Seeds of individual species and mixes are sold at the Garden. The selection changes with the season to help guide gardeners in knowing what to plant when.

This is just a sampling. There are many more excellent seed catalogs out there. Lists of additional sources are available in Richter Library. 

Jane B. Cole is librarian, Richter Library, at the Desert Botanical Garden. The library is available on weekdays to Garden visitors and for phone reference at (602) 941-1225.

Desert Detective

CASE NUMBER FOUR

"The Case of the Plants and People Connection"

(A Self-Guiding Tour for Children for use at the Desert Botanical Garden)

The Desert Detective Agency invites you to solve Sammy Saguaro's fourth desert mystery. You have been assigned to "The Case of the Plants and People Connection." The Agency has given you clues to help you learn about the plants that live in the Desert Botanical Garden. The Clues will also help you solve the puzzle. Good luck on your search.

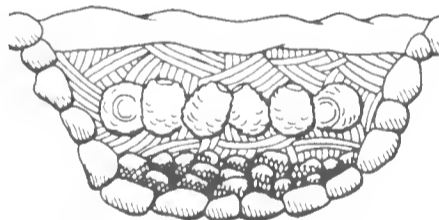


Sammy Saguaro,
the "Super Sleuth"

DIRECTIONS

1. Go to the *Plants and People of the Sonoran Desert* trail.
2. Put a mark in each clue box as you discover an example of the clue. As you discover more examples of a clue, add more marks in your clue box.

In early times people cooked foods in pits dug into the ground. Large amounts of food can be cooked this way without using too much firewood or water.



Find a roasting pit along the trail.

3. To find out what kind of detective you are, count the total number of marks in all your clue boxes.
4. What kind of DETECTIVE are you?
5-10 marks = Desert Detective
11-15 marks = Agave Ace
16-20 marks = Cactus Captain
21+ marks = Super Saguaro Sleuth

DESERT DETECTIVE CERTIFICATE: CASE NUMBER 4

_____ name

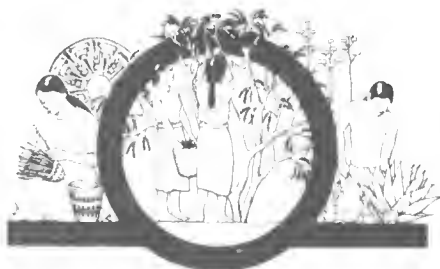
visited the Desert Botanical Garden on

_____ Date

and earned the title of

_____ Type of Detective

People have collected and used hundreds of wild plants from the desert. They knew how to find, prepare and store these plants for use year round.



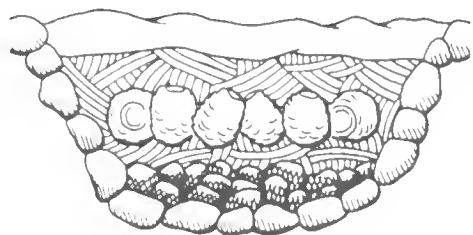
Use the signs, structures and activities on the trail to find an example of a useful desert plant.

Desert people have grown gardens of corn, beans and squash for hundreds of years. In earlier times they used these foods along with the wild desert foods they collected.



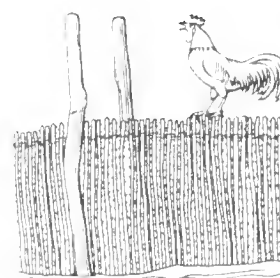
Find a garden where crops or fruit trees are growing.

In early times people cooked foods in roasting pits dug into the ground. Large amounts of food can be cooked this way without using too much firewood or water.



Find a roasting pit along the trail.

People have used desert plants to build houses, fences, corrals and other structures.



Find a house, fence, corral or other structure made out of desert plants.

People have used desert plants to build shade structures to protect themselves from the hot desert sun. They worked, played and slept under these structures.



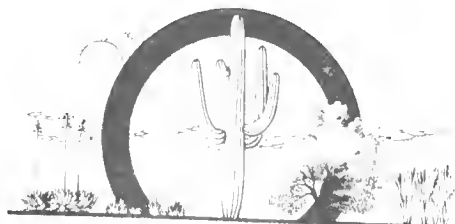
Find a structure that was built by people to provide shade from the hot sun.

In earlier times people made their own tools and household implements out of stone, wood and bone. Tools used to grind and pound food are very important, even today.



Find an example of a stone or wooden tool that could be used to grind or pound food.

Water is scarce in the desert but it can be found in streams and occasional springs. People lived near water sources and also collected run-off from rainstorms.



Find a place where there is water in a desert pond.

Many desert plants have strong fibers in their leaves. These fibrous leaves can be used to make string, rope, baskets, nets and other items.



Use the signs, plants or activities along the trail to find an example of something made from the fibrous leaves of desert plants.

Membership Support

The Desert Botanical Garden wishes to acknowledge the support of all of its 6,300 members. Recognized in the Quarterly are memberships in the Saguaro Society, Agave Century Club, Desert Council and donations received from April 1, 1991 through June 30, 1991.

Saguaro Society

The DBG recognizes the Saguaro Society for its leadership and generous support of Garden programs and services.

Barry M. Aarons
John and Christine Augustine
Atherton and Winifred Bean
William and Nancy Bidwill
Craig and Sharon Bolton
Hal Bone, Jr.
Robert and Karen Breunig
Dwayne and Nancy Burton
Jeanne Cameron
Bruce and Jane Cole
Roger and Judy Davis
Bennett and Jacquie Dorrance
Cliff and Marilyn Douglas
H. James Douglass
Margaret Eldean
LeRoy and Kate Ellison
Bradford and Birte Endicott
Constance Estes
Morton and Donna Fleischer
James and Susan Gerrity
James and Sherry New Gillespie
Pamela Grant and Dan Cracchiolo
Neil and Peggy Hiller
William and Edith Huizingh
Ronald A. Javitch
Denison and Naomi Kitchel
Samuel and Betty Kitchell
Virginia L. Korte
Delbert and Jewel Lewis
Dennis and Betty Mitchem
Robert and Ann Mueller
Harry and Rosellen Papp
L. Roy and Marilyn Papp
John and Mary Dell Pritzlaff, Jr.
Barry and Marcia Robinson
John and Kay Sack
Herb and Evelyn Smith
N. Joel and Carol Smith
Karsten and Louise Solheim
Thomas and Sarah St. Clair
Vernon and Lucille Swaback
Robert and Nancy Swanson
George and Kathleen Tyson
Virginia Ullman
Robert and Judy Walker
Jack and Carol Whiteman
Buzz and Gai Williams
Sid and Carol Wilson

Agave Century Club

Harry and Elizabeth Allen
S. P. and Karen Applewhite, III
Lilian Bartley
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Martin and Katherine Sullivan
Robert and Mary Swift
Christine Ten Eyck
Frank J. Thompson
William and Sally Woodward
Eugenia E. Wright

Desert Council

A corporate membership category, Desert Council represents an alliance between the Desert Botanical Garden and the business community.

Arizona Public Service Co.
BankAmerica Foundation
Chase Bank of Arizona
Desert Tree Farm
Gust Rosenfeld & Henderson
I B M Corporation
MicroAge, Inc.
Phelps Dodge Corp.
Security Pacific Bank
V & P Nurseries, Inc.

Honorary Donations

Gifts in honor of:

John and Christine Augustine
The Lerner Family Foundation

Memorials

Memorial contributions are used to provide for the ongoing horticultural, education and research programs of the Desert Botanical Garden. Contributions have been received in memory of:

Mary Frances Bagby
Mary B. Briece
Mary Lee Grone
Dan Carsey
Arlene W. Clark
Nettie Cedarstrand
John and Ann Flodin
J. D. and Diana Rogers
Walter Steckenrider
Rube and Dora Douglas
Cliff and Marilyn Douglas
Sarah K. Hepburn
Norman and Maxine Harden
Juanita Kennedy
Dwight and Dorothy Henderson
Walter and Helen Hofstetter
Jessie Plummer
Dorothy L. Appleby
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Edwin and Barbara Siler
E. Dennis and Charlene Siler
Pearle Steele
Rodney S. Lewis
David Diebold Thomson
Howard and Jacqueline Miller
Charles VanEpps
E. Stewart and Ruth Taylor
George "Ed" Warner
Trish LeMere

Memorial Trees

Gifts through the Memorial Tree program provide for horticultural maintenance of the trees on Ullman Terrace. Contributions have been received in memory of:

Rube and Dora Douglas
Cliff and Marilyn Douglas
John and Jessie Plummer
Employees of Harris Cattle Co.
George "Ed" Warner
All Those Who Loved Him
Heidi McClure
Michael L. McClure
David Diebold Thomson
Howard and Jackie Miller
Edwin and Barbara Siler
Dennis, Charlene, Joel and Tracy Siler

In-Kind Donations

Beverly T. Bailey
Denise Brown
Barry and Edna Burgin
Century Marketing
Barry Greisemann
Elaine Gruber
John B. Hales
Nelson W. Hope
Gary Irish
Peggy Irving
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Del and Ann Murphy
George Olin
James E. Petersen
Audrey Praker
Peter H. Raven
Nancy Rheinlander
Pat Stalzer
Tuff-lite
Elaine Wilson
Bette L. Wolfe

Donations

American Speedy Printing Center of Scottsdale
Arid Zone Trees
Arizona Humanities Council
Bach's Cactus Nursery, Inc.
Edwin and Virginia Barbey
Patricia Bowes
Dwayne and Nancy Burton
Philip D. Carl
Steven Chanan
Jerry and Dell Chapman
Elizabeth Chisholm
Cosanti Foundation
Desert Tree Farm
LeRoy and Kate Ellison
El Molino
James and Susan Gerrity
DeWitt and Judy Gibson

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Sportsman's Fine Wines and Spirits
Walter and Grace Switzer, Jr.
Uniglobe Preferred Travel, Inc.
World Marketing West, Ltd.
Carl and Sylvia Yoder

Adopt-A-Plant Donations

Plant Parents
Pat Borman
Opal Collins
George A. Cook
Raymond and Dorothea Eareckson
Florence Fine
John and Maxine Freund
Dorothy Garner
Roy Gust
Mary B. Holt
Ruth B. Johnson
Phoebe R. Landis
Susan McGreevy
Bob and Ruth Nachtigall
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Desert Gardeners
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Jane E. Kliefoth
Alfred and Janet Reid
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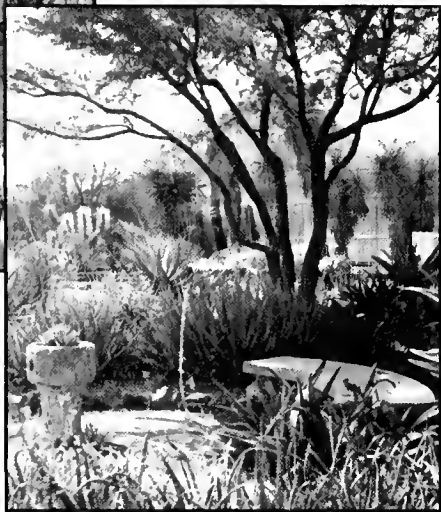
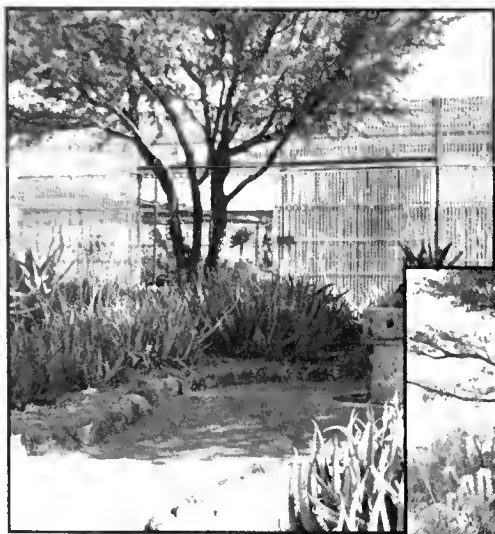


Wish List

If you have an item you believe would be useful, please call the Garden at 941-1225 for more information. And thanks for your generous response to last quarter's "Wish List!"

Bench vice
Computer
Portable heaters
Covered plastic storage containers
Battery clock
Electric utility cart
Patio table with umbrella
Microwave oven
Tool chest
Mesquite beans
Hand tools
VCR

Post Script Cartridge for HP
Laserjet III
Camper trailer
Toaster oven
Surveyor's level or transit with tripod
Leveling rod
Cement mixer
Large aquarium
3-ring binders
Storage boxes
Portable color television



Garden's Trail Revisions Begin With Stunning Shade Islands

This recently completed Shade Island serves as an example of what's to come with the Desert Botanical Garden's trail revision program. Eight additional Shade Islands will dot the trails offering shady respites for Garden visitors. The Shade Island pictured here was given in memory of Robert Roy Ferguson by his wife, Mary Doris. For information about other underwriting opportunities, contact the Garden's Development Office.

Noches de las Luminarias Membership Ticket Form

(Complimentary Member Tickets Available Only Until November 1, 1991)

I would like to order _____ complimentary tickets.
(Remember-Family Memberships valid for those family members living in the same household only.)

Membership Name _____

Membership Address _____

City _____ State _____ Zip _____

Membership Phone _____

I would like to attend *Noches de las Luminarias* on:

- ☐ December 5 (Member's Night)
☐ December 6
☐ December 7

Total number of complimentary tickets: _____

Total Number of guest tickets: _____ @ \$8 _____ @ \$3

Payment enclosed \$ _____

I would also like _____ Guest Tickets for the following evening(s): (\$8 each-adults, \$3 each-children)

- ☐ December 5 (limit 4 per membership)
☐ December 6
☐ December 7

Charge my ☐ Visa ☐ MasterCard

Card Number _____

Expiration Date _____

Cardholder's Signature _____

Detach form here and mail with a *self-addressed, stamped envelope* to The Friends of the Garden, 1201 N. Galvin Parkway, Phoenix, AZ 85008. Make checks payable to *Friends of the Garden*.

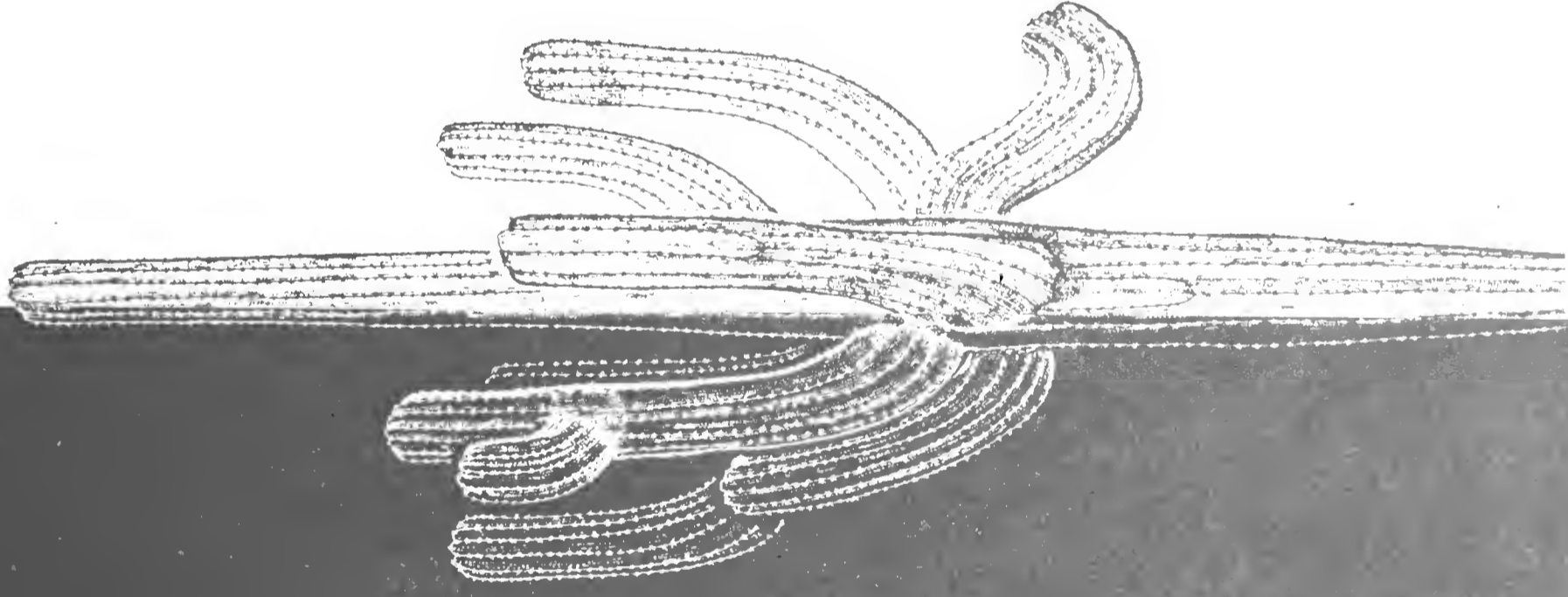


The Sonoran Quarterly
Desert Botanical Garden
1201 N. Galvin Parkway
Phoenix, AZ 85008
(602) 941-1225

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Desert Botanical Garden

*Fall
Calendar
1991*





September						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2 Birdwalk 8 a.m.	3	4	5	6	7
8	9 Birdwalk 8 a.m.	10 S.W. Desert Landscaping Section A 6:30-9:30 p.m.	11	12	13 -	14 Pine Needle Basketry 9 a.m.-2 p.m.
15	16 Birdwalk 8 a.m.	17 S.W. Desert Landscaping Section B 6:30-9:30 p.m.	18	19	20 DBG Weekend at The Great Arizona Puppet Theater	21 Reed Doll Basket 9 a.m.-2 p.m. DBG Weekend at The Great Arizona Puppet Theater
22 DBG Weekend at The Great Arizona Puppet Theater	23 Birdwalk 8 a.m.	24 S.W. Desert Landscaping Section C 6:30-9:30 p.m.	25	26 Gathering Basket 9 a.m.-2 p.m.	27	28
29	30 Birdwalk 8 a.m. Prospective Volunteer Open House-9:30 a.m.					

October						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 S.W. Desert Landscaping Section D 6:30-9:30 p.m.	2	3	4	5 Cotton Workshop 9 a.m.-2 p.m. Desert Landscaping Tour-10 a.m.
6 Puppet Show 1:30 p.m.	7 Birdwalk 9 a.m.	8 S.W. Desert Landscaping Section E 6:30-9:30 p.m.	9	10	11 Solar Dyes Part 1 10 a.m.-Noon	12 Desert Landscaping Tour-10 a.m.
13 Puppet Show 1:30 p.m.	14 Birdwalk 9 a.m.	15 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m. S.W. Desert Landscaping Section F 6:30-9:30 p.m.	16 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	17 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	18 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m. Dyes Pt. 2-10 a.m.-Noon Plant Sale-Members Preview-3-6 p.m.	19 Fall Landscape Plant Sale 9 a.m.-5 p.m. Desert Landscaping Tour-10 a.m.
20 Fall Landscape Plant Sale 9 a.m.-5 p.m. Puppet Show 1:30 p.m.	21 Birdwalk 9 a.m.	22 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	23 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	24 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	25 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	26 Desert Landscaping Tour-10 a.m.
27	28 Birdwalk 9 a.m.	29 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	30 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	31 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.		

November						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	2 "Treasures of the Desert" Family Workshop 10-11:30 a.m.
3 Puppet Show 1:30 p.m.	4 Birdwalk 9 a.m.	5 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	6 Small Rectangular Market Basket 9a m.-2p.m. Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	7 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	8 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	9 Pruning Desert Trees 9 a.m.-Noon
10 Puppet Show 1:30 p.m.	11 Birdwalk 9 a.m.	12 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	13 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m. Becoming a Birder-Pt.1 6:30-8:30 p.m.	14 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	15 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	16 Becoming a Birder Pt. 2 (Field Trip 8 a.m.-Noon)
17 Puppet Show 1:30 p.m.	18 Birdwalk 9 a.m.	19 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m. A Basketful of Desert 4:30-6 p.m. Ages 8-11	20 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m. Becoming a Birder-Pt.3 6:30-8:30 p.m.	21 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	22 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	23 Becoming a Birder Pt. 4 (Field Trip 8 a.m.-4 p.m.)
24	25 Birdwalk 9 a.m.	26 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	27 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	28 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	29 Touch of the Garden 9:30 a.m.-12:30 p.m. Desert Garden Walks 11 a.m. and 1 p.m.	30

Trail Activities

Activities on the trail are free with Garden admission unless otherwise stated. Advance registration is required for activities for which a fee is charged.

Birds in the Garden

Mondays
8:00 a.m. (September)
9:00 a.m. (October and November)
Meet at admissions.

A one-hour, docent guided tour acquainting visitors with local/migratory birds and their nesting habits. Bring field glasses; wear comfortable shoes.

Desert Landscaping Tours

Saturdays
10:00 a.m. in October
Meet at admissions.

See mature examples of the wonderful variety of drought-tolerant plants that can be used to create beautiful and lush desert landscapes.

Touch of the Garden

Tuesday thru Friday
Starting October 15.
9:30 a.m.-12:30 p.m.
Along the Garden trails.

Ideal for individuals or any size group. Tour the main Garden trails at your own pace with stops at demonstration "Touch Carts" for a hands-on experience.

Desert Garden Walks

Tuesday thru Friday
Starting October 15.
11:00 a.m. and 1:00 p.m.
Meet at Admissions.

A one-hour, docent guided tour through the Garden showing visitors how desert plants have adapted to survive in their desert environments.

Special Events

Friends of the Garden Open House for Prospective Volunteers
September 30 (Monday)
9:30 a.m.
No admission charge.

Join us for an informal coffee and discover the many opportunities for volunteering at the Desert Botanical Garden. Call 941-1225 for information and an invitation.

Fall Landscape Plant Sale

October 18 (Friday)
Members Only
3:00 - 6:00 p.m.
October 19 and 20 (Saturday and Sunday)
Open to the Public
9:00 a.m. - 5:00 p.m.

There is no charge for admission to the Plant Sale where the Garden offers a large and varied selection of drought-tolerant trees, shrubs, ground covers, cacti, agaves and other succulents. Also available are wildflower seeds and books on desert landscaping. Garden Horticulturists will be on hand to help with plant selections and answer questions.

Music in the Garden

These informal concerts on the beautiful Ullman Terrace offer a wide variety of musical talents. Optional brunch is served beginning at 10:30 a.m.. Music begins at 11:30. Season opener: October 27. Concert tickets: \$4 each plus Garden admission. Fall series of five concerts available for \$15.

Desert Landscaping and Horticulture

Southwestern Desert Landscaping: A Practical Environmental Approach
September 10, 17 and 24 (Tuesdays)
October 1, 8 and 15 (Tuesdays)
6:30-9:30 p.m.
Webster Auditorium
Instructor: Ron Dinchak. Non-member \$12, Member \$10 for each lecture. Non-member \$50, Member \$40 for the lecture series. **Advance registration required.**

Desert Landscaping can be lush and beautiful. This comprehensive lecture series will help participants develop the basic skills necessary to begin planning their own desert landscaping. Although the course is designed to encompass Sections A-F, participants may register for any section(s) individually.

The first three lectures (Sections A-C) are recommended for those participants who would like a basic foundation in design and desert plant material or for those who would like a refresher in these areas. The last three lectures (Sections D-F) explore special landscaping needs and maintenance strategies.

A series-comprehensive manual, written by the instructor, will be available at each lecture for \$5.

Section A
Landscape Plan and Design
September 10 (Tuesday)

This section emphasizes landscape design principles, landscape objectives including the mini-oasis concept and proper sequencing of landscape installation.

Section B - Landscape Plant Materials
September 17 (Tuesday)

This section explores the trees, succulents and semi-succulents best suited for desert landscaping. These plants and those described in Section C help in planning for a very lush, low-water use landscape.

Section C - Landscape Plant Materials
September 24 (Tuesday)

This section features different types of shrubs, vines, groundcovers and herbaceous (woody) perennials which can be used in desert landscaping. It is highly recommended that participants take both Sections B & C to develop a basic understanding of appropriate desert landscape plant material.

Section D - Special Landscape Needs
October 1 (Tuesday)

Do fruits and vegetables fit into a desert landscape? Do desert soils need to be improved? Is composting a good idea? These questions and how to go about resolving them form the basis of this lecture on special landscaping needs.

Section E - Special Landscape Features
October 8 (Tuesday)

This section looks at the special needs of landscaping around a pool, using annual wildflowers and landscaping for wildlife habitat. It covers the basics of converting a turf grass landscape to a desert landscape.

Section F - Maintaining a Southwestern Landscape
October 15 (Tuesday)

This section provides information about how and when to water and fertilize, the best ways to control pests and tips on when to plant.

Desert Landscaping and Horticulture (Continued)

Pruning Desert Trees
November 9 (Saturday)
9:00 a.m. - Noon
Webster Auditorium

A three-hour lecture/slide workshop teaching some basic pruning techniques to use on desert trees. Included will be examples of situations that may come up while pruning as well as where and how to properly prune using standard procedures approved by the International Society of Arboriculture. Instructor: César Mazier. Non-members \$16. Members \$12. **Advance registration required.**



Natural Crafts

Pine Needle Basketry
September 14 (Saturday)
9:00 a.m. - 2:00 p.m.
Webster Auditorium

A workshop teaching how to make a pine needle basket using natural plant material. All materials are included in the price. Instructor: Sharie Monsam. Non-members \$18. Members \$14. **Advance registration required.**

Reed Doll Basket
September 21 (Saturday)
9:00 a.m. - 2:00 p.m.
Webster Auditorium

This basket woven in the traditional over-under pattern will fit a medium sized doll or several smaller ones. All materials are included in the price. Instructor: Bonnie Bogie. Non-members \$20. Members \$16. **Advance registration required.**

Gathering Basket
Septmber 26 (Thursday)
9:00 a.m. - 2:00 p.m.
Webster Auditorium

Make a deep, square-shaped basket with a braided handle. Natural split, flat reed will be used and the price includes all materials. Instructor: Diane Wilson. Non-members \$22. Members \$18. **Advance registration required.**

Solar Dyes
October 11 and 18 (Fridays)
10:00 a.m. - 12:00 p.m.
Webster Auditorium

In this two-session workshop, instructions and recipes will be given for making solar dyes with various types of plants. Participants will dye yarn and take home at least 12 different samples of dyed material. Instructor: Alice Curd. Non-members \$28. Members \$24. **Advance registration required.**

Small Rectangular Market Basket
November 6 (Wednesday)
9:00 a.m. - 2:00 p.m.
Webster Auditorium

A functional, plaited basket made of reed with an oak handle. The basket measures 10" x 6" x 10" and can be personalized with colored reed. All materials are included in the price. Instructor: Yarm Falater. Non-members \$26. Members \$24. **Advance registration required.**

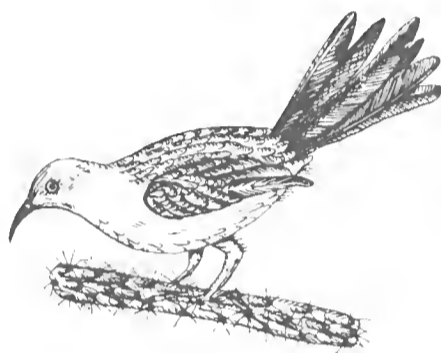
Bird Watching

Becoming a Birder
November 13 and 20
(Wednesday Lectures)
6:30 - 8:30 p.m.
Webster Auditorium

November 16 (Saturday Field Work)
8:00 a.m. - Noon

November 23
(Saturday - Field Work)
8:00 a.m. - 4:00 p.m.
Field locations to be announced.

A four-session workshop designed to teach the basics of birdwatching through lecture and field work. Information includes what kinds of birds are seen in the Phoenix area and how to identify them. This workshop finishes in time to allow participants to help with the annual nationwide Christmas count. Instructor: Mary Irish. Non-member \$28. Member \$24. **Advance registration required.**



Desert Ethnobotany

From Cotton Boll to Cotton Cloth
October 5 (Saturday)
9:00 a.m. - 2:00 p.m.
Webster Auditorium

This workshop teaches about historical cotton crops in the desert and how cotton was ginned, carded and woven. Participants will have a hands-on carding and spinning experience with replicated Pima spindles. Participants will complete a small weaving on a simplified loom using cotton yarns. Instructor: Barbara Gronemann. Non-members \$20. Members \$18. **Advance registration required.**



Children's Activities

Treasures of the Desert:
A Family Workshop
November 2 (Saturday),
10:00 - 11:30 a.m.
Ages 5-11 with parent.
Meet at admissions.

A secret clue map will guide participants on a "treasure" hunt where they are introduced to interesting tastes, smells, sights and sounds of the desert. These activities will increase children's awareness and appreciation of the delicate desert environment. Instructor: Barbara Gronemann. Non-members \$12. Members \$10. **Advance registration required.**

A Basketful of Desert
November 19 (Tuesday)
4:30 - 6:00 p.m.
Ages 8-11
Webster Auditorium

A Thanksgiving table decoration from the desert will be created in this workshop. Children will learn about desert plants as they select and arrange dried pods, stems, leaves and other colorful materials. Instructor: Barbara Gronemann. Non-members \$14. Members \$12.

The Desert Botanical Garden
Weekend at The Great Arizona
Puppet Theater
September 20 (Friday)
10:00 a.m. and 7:30 p.m.

September 21 (Saturday)
10:00 a.m. and 2:00 p.m.

September 22 (Sunday)
2:00 p.m. and 4:00 p.m.

The Great Arizona Puppet Theater
3826 N. 3rd St.
Phoenix, Arizona 85012

Come to The Great Arizona Puppet Theater for a special weekend of performances of "Hotel Saguaro." Sing-alongs, puppet making and audience participation are included in each mini-workshop. Call the Garden (941-1225) to obtain coupons for \$1 off admission at the Theater. Each child attending the show will receive a free admission pass for a visit to the Desert Botanical Garden.

Puppet Shows
Free with Garden admission.
Sundays
1:30 - 2:30 p.m.
Webster Auditorium

These puppet shows have been created by The Great Arizona Puppet Theater to help young audiences understand how animals, people and plants live in the desert.

"Hotel Saguaro"
October 6, November 3

"Zoner and the Drip"
October 13, November 17

"Creepy, Crawly, Wild and Woolly"
October 20

"Seasons of the Desert"
November 10

Plant Hotline

Do you have a question about a plant or a problem with your desert landscape? Call our Plant Hotline (941-1225) M-F 10:00 am - 11:30 am and we will try to help!



DESERT BOTANICAL GARDEN EDUCATIONAL PROGRAMS

The Desert Botanical Garden offers a great variety of educational programming. Here is a brief outline of some of the activities that we provide for visitors, adult groups, student groups and for youngsters visiting the Garden with their families.

Touch of the Garden - provides hands-on experiences with desert plants at "Touch Carts" located along the trails. Ideal for individuals or any size group wishing to tour the Garden at their own pace with stops at the demonstration "Touch Carts." Instructors: Desert Botanical Garden Docents. The "Touch of the Garden" is offered Tuesdays through Fridays October through May.

Desert Garden Walks - a general admission, one-hour docent guided tour through the Garden showing visitors how desert plants have adapted to survive in their environments. These tours are provided Tuesdays through Fridays during October through May.

Desert Landscaping Tours - a general admission, one-hour docent guided tour to see mature examples of the wonderful variety of plants that can be used to create beautiful landscapes. These tours are done on Saturdays during our planting months of October and March.

Birds in the Garden - a general admission, one-hour docent guided tour to acquaint visitors with local and migratory birds and their nesting habits. This tour is offered every Monday morning during the year.

Desert Detective - a free activity/game sheet which encourages each child to discover mysteries of the desert during a visit to the Garden.

Teacher Aids - *The Sonoran Desert*

Handbook: *Desert Study Unit* provides information, introductory and follow-up lessons for classes that visit the Garden.

Puppet Shows - created by the Great Arizona Puppet Theater in cooperation with the Garden's education department to help young audiences understand how animals, people and plants depend on each other. The Garden has special weekend performances of "Hotel Saguaro" and "Seasons of the Desert." These shows are available free to schools as an outreach program.

Teacher In-Services - teacher and school administrator workshops focusing on the concepts of desert ecology through hands-on activities. Teachers are introduced to Garden educational opportunities and material so they can successfully design student educational experiences which supplement classroom objectives. Presentations can be tailored to meet specific needs of school programs.

Plantimal Safari - based on the Garden's "Plantimal Safari" coloring book and designed for pre-school through first grade. Students are led on a "safari" through the Garden to find the plants that look like animals using creative movement, followed by storytelling and puppet making.

Treasures of the Desert - an environmental education experience designed to foster an appreciation of the desert. Students in grades two through six use mystery maps and hidden clues to explore the desert environment. This workshop was developed by Barbara Groneman of Southwest Learning Sources in cooperation with the Garden's education department.

ABOUT THE INSTRUCTORS FALL 1991

Bonnie Bogie - Fiber artist with a flair for color and texture. She has taught classes in Canada, Arizona and California and her work can be found in galleries in all those places. She is advisor to the Desert Art Studio, member VAA, and creator/designer of the Gypsy Flower collection which is now being marketed nationwide.

Alice Curd - Active in natural dyeing within special interest groups in the Telarana Weavers and Spinners Guild. She is the current president of that guild and has demonstrated for elementary schools, gifted classes, high schools and college classes. Alice has also done "From Fleece to Finished Product" demonstrations at the State Fair, Cotton Research Center and the Phoenix Zoo. She teaches natural solar dyeing classes at the Fiber Factory in Mesa and dyes for The Cottage Industry in Tempe. Desert Botanical Garden Volunteers - These volunteers are extensively trained in desert ecology. This training has also included experience in educational interpretation and horticulture. Ron Dinchak - Author of *An Illustrated Guide to Landscape Shrubs of Southern Arizona* and *An Illustrated Guide to Landscape Trees of Southern Arizona*. He is currently a professor of environmental biology at Mesa Community College. A popular Valley instructor and consultant in desert landscaping, he has been teaching classes at the Desert Botanical Garden since 1979.

Yarm Falater - The current president of Basket Artisans of Arizona, a basketry guild. She enjoys making all types of baskets and has been teaching basketry since 1985.

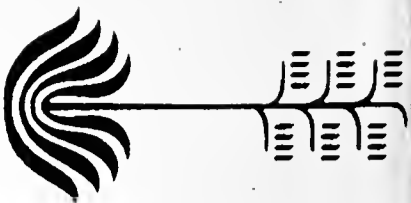
The Great Arizona Puppet Theater - Co-founded by professional Puppeteers Nancy Smith and Ken Bonar and incorporated in 1983 as a touring theater in Arizona. The company's permanent downtown Firehouse

Theater opened in 1988 featuring weekend performances of traditional and Arizona heritage stories. The company tours and conducts classes and workshops.

Barbara Gronemann - A curriculum specialist on the Southwest with a masters in education from Columbia University, she is a certified teacher and former museum educator at Pueblo Grande Museum. She is the director of Southwest Learning Sources and has taught classes at the Garden since 1981. Mary Irish - Plant events coordinator at the Desert Botanical Garden. She manages the Garden's Public Horticulture Program and supervises the propagation of plants from the Garden's plant collection for sale.

Cesar Mazier - Superintendent of horticulture at the Desert Botanical Garden. He has a bachelor of science in agriculture from the University of Honduras and a masters in agriculture from New Mexico State University. He has been with the Garden since 1987. Sharie Monsam - 1988 Artist of the Year for the City of Mesa. She has been teaching fiber art classes in the Valley since 1975 and at the Garden since 1985. Chosen to represent Arizona in Canadian fiber art shows in 1986, she has also participated in shows in California and New Mexico. One of her tapestries is displayed in the sanctuary of St. Bridgit's Church in Mesa, Arizona. Diane Wilson - A basketry instructor at the Desert Botanical Garden since 1978. She has studied basketry in California, Illinois and Arizona. A past president of the Arizona Weavers and Spinners Guild, her baskets are displayed and sold at the Craftsmen's Cooperative Gallery at Heritage Square in Phoenix.

Desert Botanical Garden
1201 N. Galvin Parkway
Phoenix, AZ 85008



Desert Botanical Garden

MEMBERSHIP APPLICATION

Join the Garden now! If you're not already a Garden member, why not consider the benefits of joining: unlimited free admission for one year; guest passes for family or friends; a subscription to all our publications, including the Calendar of Events (for early notification of Garden activities, which fill up quickly); invitations to preview events; discounts on classes and at the Garden Gift Shop and Greenhouse.

☐ **YES! I WANT TO ENJOY THE BENEFITS OF GARDEN MEMBERSHIP.**
CATEGORY OF MEMBERSHIP I HAVE SELECTED:

- ☐ \$30 - *Individual* - All benefits PLUS 4 guest passes
☐ \$40 - *Family* - All benefits PLUS 8 guest passes
☐ \$60 - *Contributing* - All benefits PLUS 10 guest passes
☐ \$125 - *Agave Century Club* - All benefits PLUS 12 guest passes, invitation to special Century Club events, recognition in Garden publications.

- ☐ \$1000 - *Saguaro Society* - All benefits PLUS unlimited guest privileges, invitation to Saguaro Society events and recognition in Garden publications.

Name _____ Payment enclosed \$ _____
Address _____ Please bill my: Visa ☐ MasterCard ☐
City _____ State _____ Zip _____ Card # _____ Expt. Date _____
Phone _____ Cardholder signature _____

REGISTRATION FORM

You may register in person, by mail or by phone using MasterCard of VISA (12:30 p.m. - 4:30 p.m. weekdays). To register more than one person, attach additional sheet. Because group sizes are limited, receipt of check does not guarantee enrollment. Registration will be confirmed by mail.

Admission	
Adults	\$4.00
Seniors	\$3.50
Children 5-12	\$1.00
Children under 5	Free
Members	Free

Garden Hours:
The Garden is open every day of the year, including holidays.
(Except Christmas Day).

June - August: 8:00 a.m. until Sunset
September - May: 9:00 a.m. until Sunset
Gift Shop Hours: 9:00 a.m. until 5:00 p.m.
Sales Greenhouse: Opens October 1
10:00 a.m. - 2:00 p.m.
(Monday - Friday)
10:00 a.m. - 4:00 p.m.
(Saturday & Sunday)

ACTIVITY

FEE (MEMBER)

FEE (NON-MEMBER)

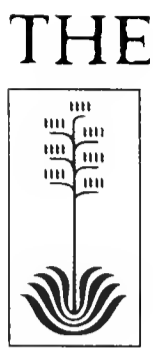
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TOTAL	_____	_____	_____

Name _____ Payment enclosed \$ _____

Address _____ Please bill my: Visa ☐ MasterCard ☐

City _____ State _____ Zip _____ Card # _____ Expt. Date _____

Phone _____ Cardholder signature _____



THE SONORAN QUARTERLY

The bulletin of the Desert Botanical Garden, Phoenix, Arizona
Winter 1991/1992 Volume 45, No. 4



How We Live Desert House Project Underway

by Carol Schatt

Construction of the long-awaited Desert House began November 6, at the Desert Botanical Garden.

The project is the culmination of a demonstration/experiment envisioned in the mid-1980's, and is coming to reality with the combined efforts of several organizations.

The house, located south of Archer House, combines a variety of innovative systems already proven effective in conserving water and energy. It is expected to reduce water and energy consumed by a typical three-bedroom, single-family residence in Phoenix by 40 percent. For example, it is projected the Desert House will use 107 gallons of water per day, per person. Present Phoenix residential use averages about 180 gallons per day, per person.

The prototype residence, expected to be open next Fall, will eventually be home to a family whose normal living habits in terms of energy and water consumption will be monitored by computer in order to assess the success of the conservation features of the dwelling. Once completed, tours of the exhibit will be offered on a regular basis.

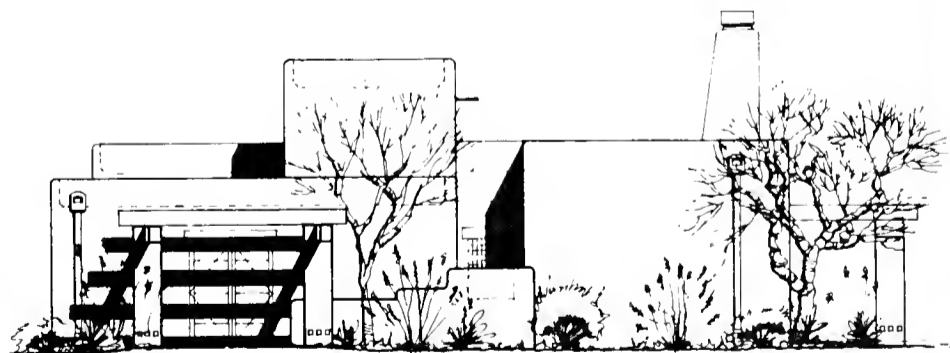
The goal of the project is to create an energy efficient home, with affordable technologies available today, for a median-income family. The house will use a heat pump

and an evaporative cooler, water-efficient landscaping, grey water irrigation, low-flow shower heads, a rainwater-capture system and other techniques to cut water and energy use.

"Getting down to the core of the issue, this house will present ideas both to the general public and to builders on how we can develop a more desert-appropriate lifestyle and the central role arid-land plants play in this lifestyle," said Robert Breunig, executive director of the Desert Botanical Garden.

"Why is such a demonstration project to be located at the Botanical Garden? Because desert plants are a major part of water conservation and because the placement of trees is a major part of energy conservation. These are key elements in the conservation design of Desert House," Breunig said.

(continued on page 4)



WEST ELEVATION - DESERT HOUSE

This shows the architect's model of Desert House.



Desert Journal

2



by Robert Breunig
Executive Director

After years of planning, the Desert House Project is underway. The Desert House exhibits, when combined with the landscape and vegetable garden displays near the Archer House, will form the Center for Desert Living, a set of displays designed to encourage a harmonious approach to living in the desert environment.

Human beings have lived in the world's deserts for thousands of years. Far from being places that are inherently unlivable, deserts have given rise to cultures marked by invention and profound human achievements. Indeed, desert regions have been the birthplaces of many civilizations. Until relatively recent times, desert cultures were, by necessity, finely tuned to and constrained by the character of the desert. Desert peoples understood where it was that they lived and developed ingenious methods for sustaining their cultures in demanding environments.

With the coming of the Industrial Revolution, the advent of cheap oil and the technological means by which to move massive amounts of water into the deserts, the delicate balance of desert life has been changed. We have created a new desert culture based upon over-

consumption of limited resources and radical environmental modification. We have built entire communities completely at odds with the environment, characterized by poorly insulated homes reflecting architectural styles derived from temperate regions and made livable through the extravagant use of fossil fuels. We have planted water-intensive landscapes that seek to recreate lush images of other times and other places.

We have built a comfortable life for ourselves in the desert, but at an extremely high environmental cost.

Yet, no one person and no one society is willing to give up that which has brought comfort and ease to human life. The challenge before us is to create a desert culture that enables us to utilize the best that modern life has to offer while making efficient use of non-renewable resources.

With its demonstration of passive energy savings technologies, water conservation strategies, and its displays of desert landscaping designed to conserve both water and energy, the Desert House Project presents a positive alternative toward a more desert-appropriate way of living. It is not presented as the only alternative or the ultimate answer, but it represents a step toward redefining our lifestyle from that of over-consumption of natural resources toward conservation and balance. It will also encourage an end to our estrangement from our own desert country by encouraging the incorporation of desert plant material into our daily lives, not just to save water and energy but because it is a beautiful and desirable thing to do. Desert House will help us honor the region we have taken up as our home.





*Happy Holidays
from everyone at the
Desert Botanical Garden!*

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Accredited by the American Association of Museums

THE SONORAN QUARTERLY (ISSN 0275-6919) is published four times a year by the Desert Botanical Garden, 1201 N. Galvin Parkway, Phoenix, AZ 85008 as a continuation of *Saguaroland Bulletin* which concluded publication with the September, 1990 issue, vol. 44, no. 2.

Managing Editor: Heli N. Mang
Editor: Carol Schatt
Original Design: Moonlight Designs

(continued from page 1)

Project partners include the Arizona Department of Commerce Energy Office, the Salt River Project, the City of Phoenix Department of Water and Wastewater, the Desert Botanical Garden and the University of Arizona. The architects for the project are Davis, Fredrickson, Davis. Members of Valley Partnership, a consortium of construction-industry related businesses, is donating thousands of dollars' worth of building materials and services to the project. Linthicum Construction will be the general contractor.

The Desert House will be part of the new Center for Desert Living which also includes the Rhuart Demonstration Garden. An adjacent visitor center is also under construction and will feature interactive computers, video presentations and displays showing the home's water and energy use.

"...this house will present ideas to the general public and to builders on how we can develop a more desert-appropriate lifestyle."

The masonry house will provide 1,594 square feet of living space on a lot of 7,000 square feet. Estimated price of the three-bedroom house is between \$125,000 and \$127,900.

The Desert House demonstration project will continue for at least a decade and will evolve during that time as new technologies are developed. In the meantime, the project promises to give a new, practical look at how individuals can make a difference in conservation of our fragile desert environment.



Desert House Conservation Features

Cooling

- 8" Integra Mass Block (thermal mass walls)
- R-38 insulation in the roof (minimum HUD guidelines are R-19)
- Space ventilation
- Double-glazed windows
- Heat pump - high efficiency, multi-speed, three function
- Landscaping located to reduce heat gain on exterior walls

Heating

- Direct solar gain (south-facing windows with overhangs to block high summer sun and welcome low-angle winter sunshine)
- Heat pump
- Rumford fireplace (designed to optimize radiant heating)

Household Items

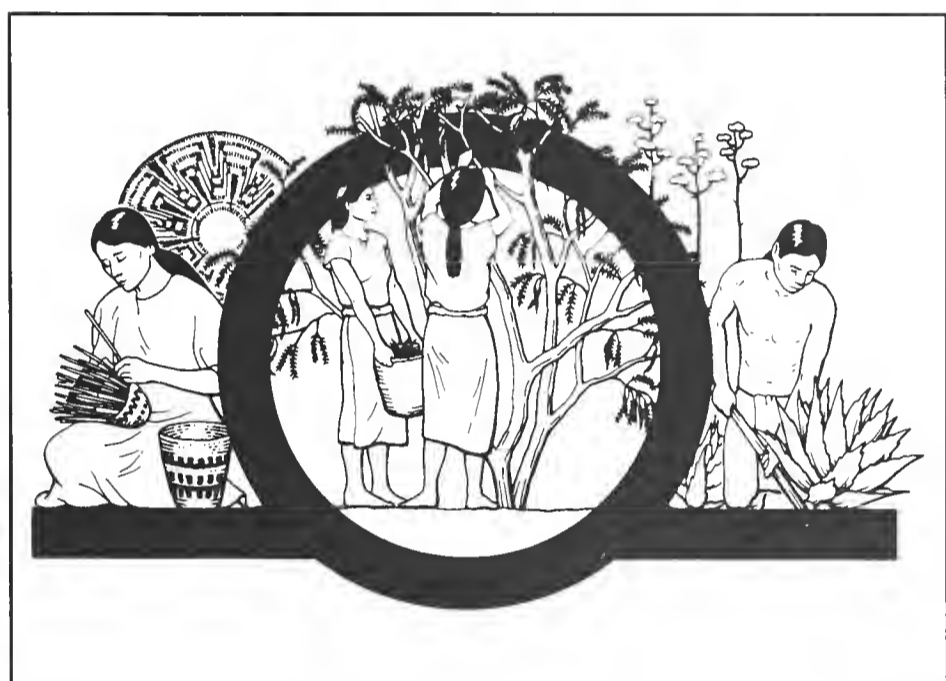
- Energy-efficient appliances
- Ceiling fans
- Compact fluorescent light bulbs
- Natural day lighting from windows, including clerestory windows

Water Conservation Measures

- Water-conserving landscape design
- Low-water use plants
- Minimum turf area
- Mulch around plants to reduce evaporation
- Drip irrigation systems
- Seasonal gardening
- Water evaporation retardation in spa
- Rainwater harvesting (tanks will collect it while driveways and walkways will be designed to direct rain to vegetation)
- Devices for reducing water use in plumbing fixtures and appliances
- Water-efficient evaporation cooler
- Water-efficient shower heads and faucets
- State-of-the-art, water-saving toilets
- Greywater experimental reuse systems to drain wastewater from bath, shower, sinks, and washer

Early People Faced Same Desert Hardships With Different Approach

by Carol Schatt



Although the migration of Easterners into Arizona has probably altered to some extent the climate and vegetation here, Native American peoples have faced for hundreds of years the same drought and heat which we experience today.

Earlier cultures dealt with life in the desert in radically different ways than our present-day society in the Salt River Valley. We alter the air's temperature in our homes and cars, pipe water directly to where we want it in house and garden, grow exotic plants which depend upon us for survival and we extend our daylight activities into night. The Tohono O'odham people (or Sand Papago, as we have named them) adapted in different ways to the harsh rhythms of the land.

They moved to where they could find food. They ate what they could capture - rabbits,

insects, reptiles, rodents, fish, cactus fruits. They lived in small groups because larger ones risked starvation. They did not build permanent houses because food would likely run out before construction was finished.

Farming was minimal and done with a digging stick during the short season between rain and drought, or between floodwaters and drought. Some groups were able to develop canal irrigation. Crops of corn, squash and tepary beans had to grow quickly to produce food in the brief growing season.

Sonoran Desert natives used at least 225 different species of wild plants, according to Charles Bowden, author of *Killing the Hidden Waters*. It is likely these diverse sources of nutrition provided a healthier diet than a narrower, agricultural monoculture. At any rate, it made the people migratory.

Desert life extracted a high price. Bowden writes, "The calendar of the Papago demonstrates this cost. May was called the 'painful moon' because the food produced by winter precipitation was gone and the downpours of the summer monsoon had not yet arrived. The new year began with July and the rains. Harvest came in October and November. January, the launching of the white man's cycle, slipped through the Papago calendar with a simple notation: 'animals thin.' February was 'smelly' in recognition of the rut of the deer. The green month - March - recorded the leafing of the mesquite. The flowers of April were noted as 'yellow moon.' Then May, 'hunger,' and the return of 'painful moon.' June was called 'black seeds' after the saguaro fruit. By making wine from this bounty, the Papago made magic and beckoned the July rains and a new year."

Modern people can learn much from the ways in which these native people adapted to the environment which we all share.



Rhuart Demo Garden Shows Desert Landscaping Can Be Water Thrifty And Beautiful

by Carol Schatt

The John H. Rhuart Demonstration Garden will nestle like a cozy shawl around the Desert House and the two will make up the new Center for Desert Living at the Desert Botanical Garden.

Since its construction in 1985, honoring John H. Rhuart who was a founder of the Desert Botanical Garden and a Board member for 30 years, the Rhuart Garden has showcased water-conservation ideas for home landscapes and gardens.

People studying the energy-saving ideas of the Desert House will also be looking closely at the Rhuart Garden where heat- and drought-resistant plants provide year-round blooms. Drip irrigation and judicious use of plants to provide shade are other key conservation elements presented in the demonstration garden.

People studying the energy-saving ideas of the Desert House will also be looking closely at the Rhuart Garden where heat- and drought-resistant plants provide year-round blooms.

In the past year, the Rhuart Garden has been renovated season by season as plants have matured, died or needed replacement. "The interesting thing is that this garden faces north,"



The John H. Rhuart Demonstration Garden - Photo by J. Cowlin

said Cesar Mazier, superintendent of horticulture at the Desert Botanical Garden. "That is the hardest position in which to grow plants. A southern exposure offers sun in winter and summer, but a garden facing north does not get full sun in the wintertime. It is shaded by buildings and trees. From November to February - for at least four months - this is really challenging."

For example, plants caught in this shade did not bloom and became leggy, he said. Among them were chuperosa, agaves and justicias. "We substituted standard African plants and succulents such as aloes and sansevarias which can take more shade. They need a bright spot, but don't need full sun," Cesar said.

"We also planted rocks. We didn't put

them on top of the ground, we dug holes and planted the rocks and put dirt around them so they look like they've been planted forever."

Plants in the Rhuart Garden are of types readily available to home gardeners. They are well adapted to our temperatures which average a daily high of 105 degrees Fahrenheit during July and a daily average low of 39 degrees in January. They can exist, with some supplemental watering, through an average annual rainfall of 7.1 inches with destructive summer winds and in soils ranging from highly alkaline or saline to caliche and hardpan.

Cesar noted additional tips for water- and energy-conservation in landscaping:

- Water at midnight when plants absorb water and transpire less;
- Combine shade and plants. Shrubs and succulents planted in the shade of trees or other shrubs need less water;
- Decomposed granite spread over the landscape serves as an attractive dressing, retains moisture and makes an ideal medium for wildflower seed germination;
- Remember that plants grow. The most common mistake we all make, Cesar said, is to forget how large plants become. Save yourself energy and time later in pruning, trimming and removal of plants that outgrew their locations by planning for growth.

Visit the Rhuart Demonstration Garden the next time you are planning a landscape change or addition for a helpful look at creative ways to combine the diverse varieties of arid-land plants.



Part of Desert Lifestyle Can Include Veggie Plots



Vegetables grown at the Desert Botanical Garden.

by Carol Schatt

Yes, you **can** grow veggies in the desert. According to Paula Carson, DBG gardener, traditional Arizona crops and some unexpected vegetables can thrive in your yard with a little extra planning and care.

Paula grows the vegetable garden and herb plantings in the Rhuart Demonstration Garden. She also grows the native crops garden on the *Plants and People of the Sonoran Desert* trail and the Hispanic garden near the Spanish Ramada along that trail. Both of these plots are historic gardens, re-creating some of the methods and plant materials characteristic of gardens grown in Arizona's past.

(continued on page 8)

(continued from page 7)

Arizona soils need about two inches of compost and about three inches of forest-type mulch tilled to a depth of six to twelve inches, according to Paula. You can also add a light layer of gypsum to help break up the clay and soil sulfur to reduce the alkalinity of the soil. Plants will appreciate fertilizer containing phosphorous and nitrogen, too.

Paula recommends a raised bed for many reasons. It keeps plant roots cooler and retains moisture, promotes deep rooting and better drainage, defines the edges of the garden and wards off foot traffic.

Drip irrigation, flood irrigation or sprinkling are all good methods of watering, Paula said. At the Rhuart Garden Paula uses a drip system. But the most important thing to do is to water deeply. Deep watering promotes solid, long roots. To leach away salts, she waters this vegetable garden twice a week in the summer and once a week in the winter. She also suggests watering early in the day to minimize evaporation. Avoid sprinkling leaves, too, she said.

Paula plants in September for the winter garden, in March for summer. Winter crops include radishes, beets, carrots, lettuce, green beans, cauliflower, Brussels sprouts, broccoli and peas. A summer garden includes squash, corn tomatoes, peppers, early summer beans and melons.

Insect pests have not been a problem at the Rhuart Garden, Paula said. "We have a good ecosystem here at the Garden," she said. "If you don't spray lots of chemicals, your garden may build up natural controls. We use netting to keep the birds out of the vegetable garden and fencing for the rabbits."

NATIVE CROPS GARDEN

This garden uses seeds of species native to the Southwest and approximates native planting methods to display the sort of gardens grown by native cultures.

Paula plants cotton, corn, squash, tepary beans and bottle gourds in bermed beds which are flood-irrigated. She plants after winter rains in March and ahead of the monsoons in July for two crops a year.

She adds only mulch to the native soil, as these seeds are more adapted to the desert and she waters once a week in the summer, once every other week in cooler months.

She plants several corn kernels in a single hole and thins to the best shoot. This native corn is fed nitrogen every four to six weeks.

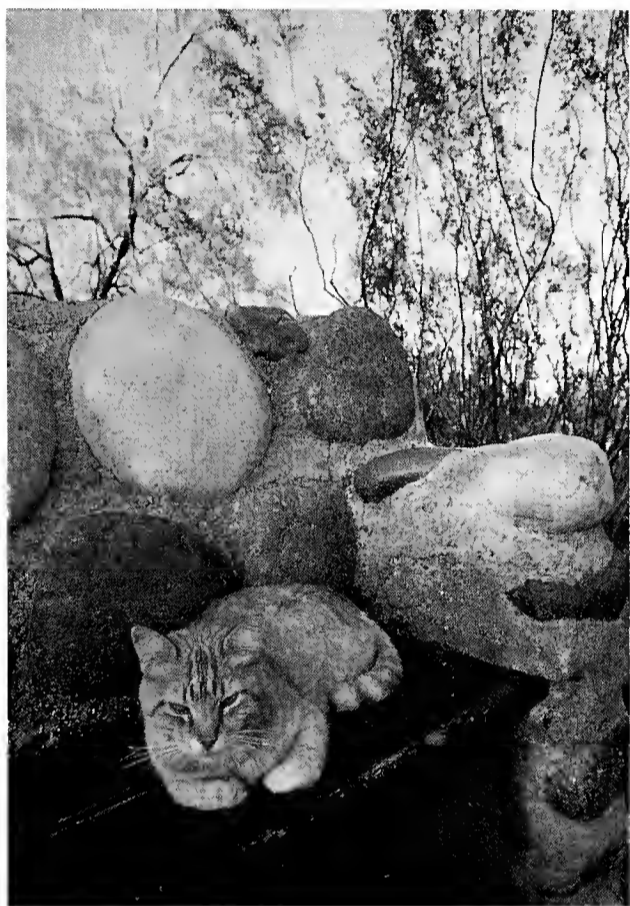
HISPANIC GARDEN

Near the Spanish ramada along the *Plants and People of the Sonoran Desert* trail are fig and pomegranate trees, which were introduced to the Southwest by the Spaniards 400 years ago. They also brought yellow watermelon, cow peas, tomatillos and sugar cane, which Paula grows in a furrow-and-hill garden with deep flood irrigation.

Gardening is a pastime we take for granted. The ability to plant and harvest food is recognized as a critical turning point in the evolution of modern civilizations. Growing your own food in a vegetable garden in your yard can be an enjoyable and rewarding hobby - one which can also give you and your family an increased appreciation for the bounty of the land.



Farewell to a Friend



Buster

Some of us only knew him for a short time. Some of us had only seen him in passing on a visit to the Desert Botanical Garden. There are others of us who have known him for years and felt as if he were a member of our own family.

No matter how we knew him, Buster, the Garden's cat, will be missed. During this past Summer, Buster died of complications associated with old age.

Buster originally belonged to Dr. and Mrs. Howard Scott Gentry who once lived in Archer House. Dr. Gentry was once research director at the Desert Botanical Garden. When the Gentry's moved out of Archer House they took Buster to their new home and Archer House was turned into the offices of the Garden's education department.

But Buster kept coming back. He loved the Garden and eventually, the Gentrys gave up

retrieving him. He loved to hunt rabbits and mice here at night. He loved to lounge on Garden benches and drowsily watch the passing visitors as if he were surveying the subjects of his kingdom. He was even known to make quite a nuisance of himself after Ullman Terrace was built and there were wonderful morsels of food to be had from the Patio Cafe customers.

Buster, like most cats, spent his days wandering around between naps. He made the rounds of the various offices, using them for his daytime resting places. In his last few months, the business office was his favorite place where Mary Catellier and Carol Smith made a comfortable bed for him and kept him royally rotund with his favorite kitty treats.

Right up until his death, Buster delighted Garden visitors with his "ferocious" antics on the new summer night tours, Desert Moonlight Walks. On some of these tours, Buster was the star attraction; winning out over the night-blooming cacti or the hawk moth.

For all those who knew him, Buster will always have a place at the Desert Botanical Garden. We suspect there are those who knew him very well who will still turn corners and expect to see Buster lounging around, or open the door to the business office and expect to see him snoozing comfortably to the sound of business machines and telephones.

Although it is not the policy of the Garden to maintain domestic pets, Buster was a special case and allowed to live out his days in the Garden. He was and always will be the Garden's friend and we will all miss him very much. ✧

Christmas Cholla Offers Charms for Garden Setting

by Mary F. Irish

Opuntia leptocaulis

Christmas cholla, tasajillo, tesajo

All of us are familiar with the plants called Christmas cactus. These exquisite, jungle-dwelling cacti have the habit of blooming in the cool season, and can be timed to bloom for Christmas, hence the name. In the Sonoran Desert there is another cactus which also reminded settlers of traditional Christmas greenery, the Christmas cholla, *Opuntia leptocaulis*.

The genus *Opuntia* is a fine collection of some of the most confusing cacti in the family. It can be roughly divided into the species which have flat, pad-like joints (prickly pears), and species which have rounded, stem-like joints (cholla).

Christmas cholla is a shrub-like cholla, which can grow up to twenty feet in height, although two to five feet is more common. Christmas cholla spines vary in length from barely an inch long to over six inches in length. The spines are tan and, like many cholla spines, are covered with a paper-like sheath which can be readily removed. Glochids, those dreaded fine bristles of pain, which are a distinguishing feature of this genus, are also present in each areole.

Plants bloom in late summer or early fall. The small bloom ranges in color from yellow to bronze and is usually an inch in diameter.

It is the fruit which gives the plant its charm in a garden setting, and is the reason for



Opuntia leptocaulis

its common name. The fruit is small but profuse and scarlet red. Fruit is persistent, staying on the plant a considerable amount of time after ripening. With its evergreen stems and bright fruit, Christmas cholla is truly a refreshing splash of color in late fall and winter in the desert.

Christmas cholla can be planted either from seed or cuttings. Plants establish quickly and grow best under the shade of a small shrub like creosote, bursage or calliandra. This is an excellent plant for a native landscape, a cactus or succulent garden or as an accent plant. It is best planted away from high traffic areas of the garden.

With its evergreen stems and bright fruit, Christmas cholla is truly a refreshing splash of color in late fall and winter in the desert.

Care is minimal. For plants to stay in good condition they should be watered at least monthly in the summer, but winter watering is rarely necessary. Cocchineal scale can be a problem in late summer, but is treated easily with strong jets of water. Plants grow slowly but can be encouraged with a little extra water.

As the holiday season approaches, and the Christmas cacti begin to bud and bloom, remember the Christmas cholla. This beautiful Sonoran native would enhance any garden.



A Lasting Gift

by Robert Breunig

In December of 1984, the late Opal Oyaas made a generous contribution which holds the promise of providing the Desert Botanical Garden with a secure financial foundation. With an initial gift of \$27,000 of stock, she launched the Desert Botanical Garden Endowment Fund. From that beginning, this fund, which has been carefully managed by trustees of the Garden and which has received several subsequent gifts, has grown to \$130,000 - an increase of 380%, in seven years. It is a goal of the Garden's trustees to use earnings from the Endowment Fund to provide additional, ongoing annual operating income for capital improvements.

To facilitate the growth of the Endowment Fund, the trustees have chosen, for now, to return all interest earned back to the fund so the principal can continue to grow. When the principal has achieved sufficient size to provide a meaningful annual contribution to the Garden, a portion of the interest income will be provided to the Garden's budget. (Some of the interest will continue to be added to the fund to protect it from inflationary erosion.)

A strong endowment will help insulate the Garden against loss of income during periodic recessionary cycles and will provide for the continuation of core programs and services.

Great as the growth of the Endowment Fund has been, additional major contributions are needed to enable it to reach its income-producing potential in the near future. When drawing up a will or planning their estates, members can make bequests of cash or securities to the Desert Botanical Garden Endowment Fund, thus ensuring the well-being and stability of the Garden for generations to come.





Desert Gardener

12 A Few Strategies Will Save Tender Plants From Freezing

By Mary F. Irish

Freezing temperature, the malicious partner of cooler weather, can make unexpected and unwelcome difficulties for the Valley gardener. Although our winters are mild, freezing temperatures do occur. Many ornamentals, including some desert plants, are susceptible to some freeze damage and need to be protected.

What happens to a plant when the temperature drops below freezing? Like most living organisms, plant cells are mainly water. Water changes into ice at 32 degrees Fahrenheit and expands at the same time. When the temperature rises, the ice thaws again to a liquid. This freeze/thaw cycle stretches the cell walls, eventually causing the cell to collapse. This little dead cell, and its thousands of similarly afflicted partners, is what we call freeze damage.

Many plants have astounding adaptations to freezing and are totally unaffected by temperatures that are life-threatening to you and me. But all plants have a temperature at which cell damage will occur, and that temperature, coupled with the length of time it was below freezing, defines a plant's frost tolerance.

The terms hardy and tender are used regularly in gardening. A frost-hardy plant is one that suffers minimal to no damage at normal freezing temperatures for the area. Frost-tender plants are those which suffer noticeable to severe damage at normal low temperatures for the area. So, while a plant's ability to withstand a certain temperature remains fixed, whether it is



Cacti can be protected from frost by placing plastic foam cups over the tips of the plant.

frost-hardy or frost-tender is relative to where it is being grown.

In the Valley, normal low temperatures can vary by as much as ten degrees within small distances - from 24 to 28 degrees in the lower elevations to 18 to 22 degrees in higher areas. This occurs because the Valley is a complicated series of hills, valleys and slopes. Where your yard is located in the Valley can greatly affect the likelihood of frost damage.

There are a number of preventative strategies which will help vulnerable plants survive freezing temperatures.

Overhead protection: Plants which are frost tender benefit greatly from the overhead protection of an evergreen tree, a large shrub, a porch or an eave of the house. As heat leaves the ground rapidly on a cold, clear night, it moves upward in something like a column. Any interruption in that flow, even a small one, can

benefit plants. At the Garden we have seen dramatic differences in the damage to some aloes. Plants exposed to the elements and in a colder location were heavily damaged, while the same species under the spreading arms of a large mesquite were virtually untouched.

Location: The location of a plant in your yard, or the location of your yard altogether, can make a vast difference in how your plants will respond to freezing temperatures. To see how this works, consider how cold air moves. Cold air, because it is heavier than warm air, tends to sink. It moves like water, rolling and flowing into low spots, getting stuck against the corner of a wall in the lowest part of the yard, and racing off a hillside. All other things being equal, the warmest spot in the yard is the highest spot. Therefore, locating such warm spots and placing frost-tender plants there will greatly increase their chances of surviving a freeze.

Planting near the house: Houses give off a vast amount of heat. It will be much warmer right up against the house, especially on the south or west sides. This fact can be used to great advantage when planning where to plant frost-tender plants. The best site for the most tender plants would be along a warm house wall with an overhead eave at the highest part of the garden.

Coverings: The options for coverings to use on a freezing night are almost unlimited. Covering a plant traps the rising warm air within, thereby keeping the temperature inside just high enough to keep the plant from freezing. Because of this, it is advisable to put a cover on before the sun has left the plant. This will maximize the amount of trapped heat.

Coverings can be anything - old sheets, pillowcases, towels, blankets or burlap. They can

be secured by throwing them over the plant, clipping or clothespinning them to sturdy branches, or draping them over a frame, table or chair if the plant is unable to hold up the weight of the covering.

The type and weight of the covering is important. Don't try to cover a fragile plant like Mexican honeysuckle with burlap, as the weight of the burlap will cause much more damage than the freezing temperatures. Never allow plastic to touch the plants. Unless the material is specifically made to stay on the plant (such as commercial frost blanket products), take it off as soon as the temperature is above freezing. And don't water through a covering unless it is specifically designed for that.

Covering frost-tender cacti is more difficult. The spines can catch and shred most coverings or, even more damaging, be pulled off when the cover is removed. Lost spines are lost for good and are not regrown.

Two methods have been used with great success for cacti. One is to cover the tips of the plant with plastic foam cups, sized just to fit the tip where growth is taking place and the plant area most vulnerable to freezing.

The other is to use a frost blanket. This white, cloth-like material allows the transmission of light and water. On cacti it can be used as a hood over the tips. For other plants it can be draped right over the entire plant. This product is now available in larger nurseries and garden centers under many brand names.

Watering: Many woody plants are able to withstand a short, freezing night better if they are well-watered. Watering should take place before sundown, and should be deep and thorough. Some gardeners recommend watering the leaves of a plant, allowing that water to freeze on the surface of the leaf. This method works on plants with strong sturdy leaves and

(continued on p. 14)

(continued from p. 13)

when a freeze is not lengthy. Do not water succulents, if you can help it, in advance of a freeze. Succulents, including cacti, will withstand freezing better if on the dry side.

No matter how careful we are, some plants will suffer freeze damage, and some plants will freeze right to the ground. Then what?

In case of woody plants, don't cut, prune or clean them until they begin to show new growth in the spring. Clearly, this is the hardest of hard tasks for most gardeners, but until you know the exact extent of the damage, leave well enough alone. As a rule, the higher leaves appear on a stem in the spring, the better.

Do not water succulents, if you can help it, in advance of a freeze. Succulents, including cacti, will withstand freezing better if on the dry side.

For cacti and most succulents, a little more direct action will help prevent secondary bacterial rot infections resulting from freeze damage. If the tissue appears clear or nearly transparent, you know significant freeze damage has occurred. Wait a few days until the leaf or stem begins to blacken and show the extent of the damage. Once the danger of further frost is past, prune it off. Be very sure to put sulfur or other bacterial and fungal preventatives on the wound.

Freeze damage is just as devastating to the gardener as it is to the plant. However, with careful siting and a little preparation, your garden can come through the winter with minimal damage.



Someone to Know

Mary's Volunteer Path Took a Turn Into Sales, Public Horticulture

by Carol Schatt

Mary F. Irish, whose effervescent charm and wide-ranging knowledge of plants have helped many volunteers find their niches at the Desert Botanical Garden, started here as a volunteer herself. Officially she is public horticulture coordinator for the Desert Botanical Garden and one of her duties in that capacity is to manage the plant sales programs.

"I took the core training course for volunteers in the fall of 1986 and worked in that plant sale," Mary recalled. The next year, when the volunteer chairman of the plant sale had to resign just a month before the sale, Mary was asked to take over. Unexpectedly, the gift shop manager, who had been the staff expert of the sale, went to another job, leaving Mary and the equally new Mary Anne Fox in charge.

"It was a whirlwind, but the sale came off and I did the spring one as well," she said. After that she wrote a proposal for a formal plant-sales program to DBG Executive Director Robert Breunig. "I wasn't sure how the proposal would be received, but I did it," she said. Dr. Breunig hired her to develop the retail plant sales program, which she has done by enlarging the Garden's annual plant sale events and further developing the greenhouse propagation of plants for sale. Both of these programs began as fundraising efforts by the volunteers for the Garden.

The first plant sale Mary chaired grossed \$18,000. Now each sale generates about \$50,000 and offers about 15,000 plants for sale - the



Mary F. Irish, Public Horticulture Coordinator

largest variety of arid-land plants for sale in one place at one time, anywhere. The sales greenhouse, now in its fourth year, grosses nearly \$80,000. To run the greenhouse program, Mary oversees a halftime sales assistant, Judy Braun-Brody and a halftime propagator, Louise Bunker. Twenty-eight volunteers staff the greenhouse which is open Monday-Wednesday from 10 a.m. until 2 p.m. and Thursday-Sunday from 10 a.m. until 4 p.m., and dozens of volunteers help with plant sale events in the fall and spring.

In addition to her work with plants for sale, Mary is developing a program to grow experimentally new plants for the home landscape. This program, already underway, will concentrate on desert plants, particularly Sonoran Desert species. Plants will be grown for two years, or, in the case of trees, ten years, to obtain information on how the plant would behave and could be successfully grown as an ornamental.

The Garden provides a perfect laboratory for experimenting with introducing new plants to horticulture.

"First, we are growing new things out of the collection," she said. "Next, we will get more purposeful and seek out other plants." Local commercial growers have expressed much interest in these Garden experiments, Mary said. She is already growing fifteen to twenty species, including *Sutherlandia frutescens* (a red-blooming African shrub), *Acacia erioloba* (an African tree), and *Randia obcordata* (a shrub from Baja).

A third facet of Mary's job is the Garden's public horticulture program. This program began as an official part of the Garden last spring includes the plant hotline, public speaking, seminars and other community outreach.

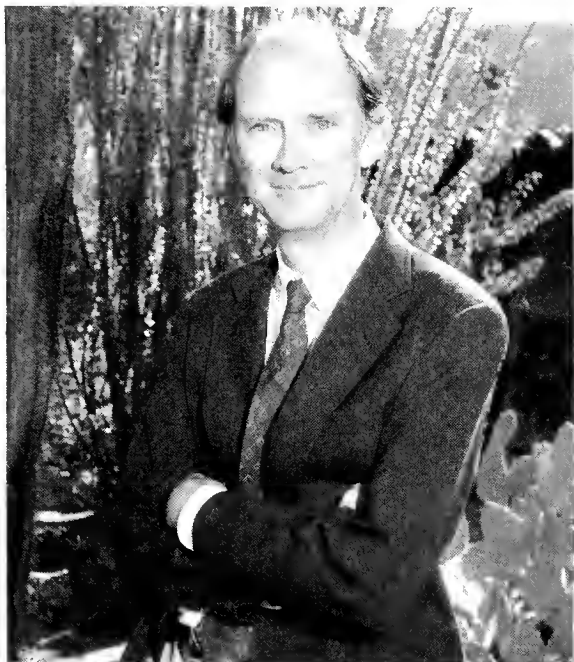
Mary grew up just outside Austin, Texas, where she earned a bachelor of arts degree in psychology at the University of Texas. She also has a master's degree in geography from Texas A&M, at College Station. She had worked as an environmental consultant in the oil industry and in personnel for a manufacturing company before moving to Arizona five years ago from New Orleans.

Mary and her husband Gary are enthusiastic bird-watchers. She teaches bird-watching classes at the Garden, having learned it herself from her father, who has written a book on the birds of Texas. Her love of plants grew naturally out of her interest in birds, she says, as well as the fact that her family grew much of their food during her childhood years.

Mary has learned much about Arizona horticulture since moving here. When I came out here I didn't know an agave from an aloe and I didn't even like agaves. But I do now!"

Visit Mary at the Sales Greenhouse (when you can catch her!) or treat yourself to one of her birdwatching classes at the Desert Botanical Garden.





Robert Breunig, Executive Director of the Desert Botanical Garden

President Bush Nominates Robert Breunig

President Bush nominated Dr. Robert Breunig to serve on the National Museum Services Board, a policy-making body for the Institute of Museum Services (IMS). IMS is a federal agency which provides support to the nation's museums. The Desert Botanical Garden is one of 10 botanical gardens nationwide accredited by the American Association of Museums.

Executive Director of the American Association of Museums, Edward H. Able, said of this prestigious nomination, "We are extremely gratified that the President has nominated Robert Breunig, Executive Director of the Desert Botanical Garden, to serve on the National Museum Services Board. It is important that our museums with living collections, such as botanical gardens, be represented on the Board. Bob Breunig is an outstanding individual who will make significant contributions to the work of the Institute of Museum Services through his service on its Board."

And Kathryn Sibley, Executive Director of the Western Museums Conference wrote in support of Dr. Breunig's nomination, "Dr. Breunig's understanding of the basic issues facing museums today, and the need for museums to respond to the societies in which they reside and operate, drives all that he does."

After being confirmed by the Senate, Robert Breunig will serve on the 15-member board until December, 1993 at which time, his appointment may be extended by the President.

"I consider this a great honor and a unique opportunity to foster the improvement of museums nationally..."

"I consider this a great honor and a unique opportunity to foster the improvement of museums nationally and to represent the interests of the State of Arizona and the West in the national museum community," said Robert Breunig of his nomination.

Dr. Breunig served at the Museum of Northern Arizona in Flagstaff before moving to Phoenix to become Chief Curator at the Heard Museum. He has been executive director at the Desert Botanical Garden since 1985. He also currently serves on the Board of Directors for the Center for Plant Conservation.


The Desert Botanical Garden congratulates Dr. Breunig on this outstanding accomplishment which is a milestone in a career guided by a profound sense of the importance of museums as community educational institutions, and a personal commitment to service and excellence.



Major Research Conference to be Held at the Garden

Dr. Gary P. Nabhan, DBG Research Ethnobotanist, announced recently that the Desert Botanical Garden will host the International Organization for Succulent Plant Study's (IOS) 22nd Annual Congress, April 5-10, 1992.

The theme of the Congress, expected to include research scientists from all over the world, will be "Threatened Succulents and their Endangered Pollinators: Conservation of Mutualisms."


The week-long Congress will include sessions on cactus and succulent systematics, anatomy, biogeography, ethnobotany, horticulture and conservation. Field trips into the Sonoran Desert and Garden tours will be included before and after the Congress. 

Member Discounts Available at the Phoenix Zoo

If you haven't visited our Papago park neighbor, The Phoenix Zoo lately, now is a good time to go.

Between November 15 and December 22, you'll receive 10% off Zoo admission when you present your Garden membership card.

The Zoo, located approximately one-half mile from the Garden on Galvin Parkway, features more than 1,300 exotic animals from around the world, many of which are endangered.


The Zoo is open from 9 a.m. to 5 p.m. daily. 

Donations Can Double With Matching Gifts

Would you like your contributions to go twice as far? So would we! Here's how donors are doubling their gifts to the Garden.

The Desert Botanical Garden is fortunate to have many of its donors participate in matching gift programs offered by employers. In fact, these matching gifts totaled nearly \$6,000 last year!

Matching gift programs are established by many corporations to enhance the donations their employees make to non-profit organizations. Most programs provide a one-to-one match, so a \$50 contribution from you could become a \$100 contribution when matched by your company. Check with your employer, even if you are retired, and see if they offer this beneficial program.

The Garden wishes to acknowledge these companies for their matching gifts in fiscal year 1991. 

Allied Signal Foundation, Inc.
American Express
ARCO Products Company
Arizona Public Service
Benjamin Moore & Company
The Chase Manhattan Corporation
Chevron Corporation
Citibank
Digital Equipment Corporation
Exxon Corporation
Nabisco Brands, Inc.
Phelps Dodge Foundation
Security Pacific Bank Arizona
Valley National Bank

Heard Museum Offers Special Rate on Lecture Series for Garden Members

Join The Heard Museum for *The People Who Discovered Columbus*, eight entertaining and thought-provoking presentations on the impact of Columbus' famous voyage and how two worlds were changed forever. Beginning January 8, and running through February 27, The Heard Museum Guild will present eight lectures by and/or about Native Americans - how they survived the past 500 years, where they are today, and where they are going. Speakers cover the spectrum from actor to anthropologist; from tribal leader to folklorist.

Desert Botanical Garden Members will receive a special ticket price on **advance purchase only** using this form or displaying a valid DBG Membership card at The Heard prior to January 8, 1992. Special prices are \$30 for the full series of eight, or \$15 for a half series of any four lectures. Regular price is \$5 per lecture, based upon availability.

Lectures are held either Wednesdays at 7:30 p.m. or Thursdays at 10 a.m. Be sure to arrive a half-hour early to enjoy refreshments.

- January 8,9 - **Oren Lyons** - Onodaga Iroquois spiritual leader/historian.
- January 15,16 - **Rayna Green** - Cherokee folklorist/cultural historian.
- January 22,23 - **Paul Ortega** - Mescalero Apache artist/singer/traditional healer.

- January 29,30 - **Jerald Milanich** - anthropologist
- February 5,6 - **Michael Horse** - Zuni/Yaqui/Mescalero Apache actor/artist/singer.
- February 12,13 - **Jenny Joe** - Navajo medical anthropologist.
- February 19, 20 - **Delia Carlyle** - Ak Chin tribal leader.
- February 26, 27 - **Jack Weatherford** - anthropologist/author.

To order your specially priced tickets, stop in at The Heard Museum Membership office or complete the form below. Make your check payable to The Heard Museum Guild and mail to: 1992 Guild Lecture Series, The Heard Museum, 22 E. Monte Vista Rd., Phoenix, AZ 85004-1480.

Name

Address

CityStateZip

Phone

Check Enclosed for:

☐ \$30 Full Series (8)
☐ \$15 Half Series (4)

When ordering half series, please indicate which four lectures you would like to attend:

Longtime Garden Friends Receive Special Recognition

Margaret Bell Douglas, horticulturist, was recently inducted into the Arizona Hall of Fame to Outstanding Arizona Women. In 1951, Mrs. Douglas donated about 1500 herbarium specimens of Mexican plants. The herbarium, now named after Lois Porter Earle, was originally named "The Douglas Herbarium" in honor of this contribution.

Mrs. Douglas and four other inductees were honored at the eleventh annual Arizona Hall of Fame Awards Luncheon on October 12.

Former Garden Director, Dr. Charles A. Huckins is the recipient of the 1991 Alice Burlingame Humanitarian Service Award. The award is given in recognition of an individual or an organization who has given freely of their time, talent and energy and having special significance for horticultural therapy on a local, state or national level.

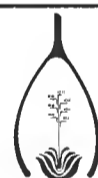
Dr. Huckins was selected for the award in recognition of his many years of dedicated service to the American Horticultural Therapy Association (AHTA), to horticultural therapy and to human service and horticulture in general. He has served the AHTA as a member of its Board of Directors and Treasurer from 1985 to 1988. He also served as a member of the AHTA's National Horticulture Industry and as Vice Chairperson of the organizing committee of the AHTA's Friends of Horticultural Therapy program. His contributions were freely given and can be expected to positively impact the Association and the profession of horticultural therapy for years to come.



Members Receive Special Discount at Hall of Flame

Desert Botanical Garden and the Hall of Flame Museum of Firefighting are teaming up for a special "Members' Open House" on Saturday, February 15, 1992. The Hall of Flame has the largest collection of firefighting equipment, art and memorabilia in the country- and it's just around the corner from the Garden at 6101 E. Van Buren!

Garden Members can visit the Hall of Flame on February 15, at **NO COST** by showing a valid DBG Membership card. The Museum is open from 9 a.m. to 5 p.m. For more information call the Hall of Flame at "ASK-FIRE" (275-3473).



Wish List

If you have an item you believe would be useful, please call the Garden at 941-1225 for more information. And thanks for your generous response to last quarter's "Wish List!"



- 4-drawer filing cabinet
- 2-drawer filing cabinet
- Blender
- Magazine binders
- Botanical books
- Desert plant and animal photographs
- 1991 Rand McNally World Atlas
- 2 office side chairs
- 2 executive desk chairs
- Tall bookshelf
- Surveyor's level or transit & tripod
- Little red wagons
- Butter dishes with lids
- Refrigerator
- Jackhammer
- Electric Cart
- 3", 3-ring binders
- 5 1/4" floppy disk file



Field Notes

20 Collections Department Receives Grant for Conservation Work

by Heli Mang

The Desert Botanical Garden is the recent recipient of a \$25,000 grant from the Institute of Museum Services, (IMS) a federal agency that provides support to the nation's museums, for work in conservation of the Garden's collection.

One of the Garden's puposes, as mandated in its mission statement, is to conserve desert flora, with a special emphasis on succulents and native plants. The Garden recently completed a survey of the collection which identified that over 80% of accessions are represented by only one or two specimens. Thus, a loss of any single specimen is likely to result in the loss of the total accession.

This grant will improve the conservation of the living collection by identifying and verifying rare species, setting up a data base to track information about the collection and making it available to staff and visiting scientists, prioritizing species to be propagated or field-collected, and developing a long-term conservation plan for each high priority taxa.

The most important result of this work will be to eliminate the threat that an entire species will be lost from the collection. In addition, the number of plants per taxa will be increased, backup specimens of rare plants will be made, and valuable information will be gained from experimentation with methods of propagation of many little-known species.

"The results of this work will mean that

the Garden will not face the same conservation problem 50 years from now," said Liz Ecker, curator of the living collection.

Garden staff working on this project will include Liz Ecker, Starr Urbatsch, plant recorder, and Lynda Pritchett-Kozak, conservation horticulturist.

The grant also provides for consulting scientists on the project. Dr. Edward Anderson will serve as a cacti taxonomist and conservation consultant. As a professor of biology at Whitman College in Walla Walla, Washington for almost 30 years, he has authored numerous books and scientific articles concerning cacti and cacti taxonomy, primarily focusing on cacti of the southwestern United States and northern Mexico. He has recently completed two World Wildlife Fund grants on conservation studies of endangered cacti in Mexico and northern Chile.

"The results of this work will mean that the Garden will not face the same conservation problem 50 years from now..."

Dr. Tony Burgess will serve as an agave taxonomist and conservation consultant. He has extensive field experience with agave and southwestern flora, and has published numerous articles related to agaves and desert plant ecology. He has also served as a consultant to the National Park Service for location of endangered plant species within Park boundaries and he designed the synthetic plant communities for the Biosphere II Project.

Steve Brack, who will serve as a propagation consultant, has owned and operated Garden Nurseries for 15 years and is considered

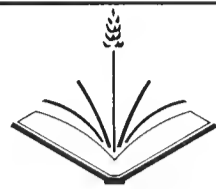
one of the foremost propagators of cacti and succulents, especially rare species. He has served as a consultant for the U.S. Fish and Wildlife Service, the U.S. Forest Service and the National Park Service and has been involved in surveys, recovery plans, propagation and rescue of rare cacti of the U.S.

Guadalupe Malda, also a consultant for the project, has worked as a Conservation Research Scientist for six years at the Institute of Ecology and Food in Victoria City, Mexico. She has extensive experience in conservation and micropropagation of rare and endangered cactus species, especially those species of the Sonoran and Chihuahuan Deserts.

This IMS conservation grant is representative of the Garden's ongoing commitment to conservation work. A very important part of the Garden's living collection is the conservation collection, comprised of over 100 taxa and 1,500 rare, threatened or endangered plant species. In addition to living plants, genetically diverse seeds and pollen of both rare and common plants are stored in the Garden's seed storage program. The Garden is particularly known for its collection of cacti and agaves, many specimens of which represent globally rare species, are not represented in other North American botanical gardens and are rarely seen either by scientists or the public.

The Garden is also one of 20 botanical gardens that make up the Center for Plant Conservation (CPC). As a member of the CPC, the Garden maintains 30 rare plant species of the southwestern United States as part of the CPC's National Collection.

The IMS grant, as well as the other extensive conservation work being done by the Desert Botanical Garden will help to ensure that the species of the Sonoran Desert currently and potentially under threat will be preserved for future generations.



In Print

In Print

Story of Sonoran Lands Entertains, Appalls With Charm of Fiction

by Jane B. Cole

Killing the Hidden Waters

By Charles Bowden

174 pp. Austin. University of Texas Press, 1977.

As a vigorous proponent of the theory that you get more facts out of reading fiction than non-fiction, I find it hard to admit that this is really a fact-packed book. It is non-fiction, it is entertaining, it is available in paperback and it is a great way to meet Charles Bowden. The story Bowden is telling here is a true story about real land and real people and he does it well.

Thanking people in his acknowledgements, Bowden says, "Finally, I'd like to thank the late J. Newfoundland. He didn't give a damn about this book and his healthy perspective on such matters saved me from completely losing my own."

That, my friends, is the tone of all of Charles Bowden's writing. It is the Edward Abbey school of speaking the truth while entertaining, appalling and instructing the reader all at the same time. Abbey did it best in fiction, Bowden in non-fiction.

Killing the Hidden Waters is the story of the lands of the Sonoran Desert, the people who have lived here and the dramatic changes that took place here with the arrival in these lands of the United States government and its people. Early on Bowden takes his stand concerning the uses made of the land and its resources:

"...Man builds water-rich societies in arid lands by living out of balance with his water supplies. He uses water faster than it can be replaced by rain. When this fact becomes obvious, people call it the groundwater problem."

In outlining and describing the land, he uses wonderful images of the kinds of life that were once possible in the desert, making it obvious that he considers himself one of us. When he criticizes people, he does it with compassion for himself and everyone else. Add to this his great understanding of the various tribes and groups of people inhabiting the desert Southwest. He never discusses the "Indians" because he knows that the way of life of each group of people was different. He sees our cultures differing mostly in the ways we use water and the resources that result from its availability or non-availability.

"Aside from one small patch of ground annually gardened in the Pinacates, the Sand Papago did not till the earth. They were nomads...Their constant coming and going reflects the area's hydrology and weather...Early Europeans felt that the Sand Papago were exceptionally barbaric...The Spaniards wondered how humans could survive in such a place 'full of rocks...and cacti.'"

Now that some ancient cultures are gone, we wish we could discover the legacy they might have left us. They knew how to use and replenish the resources of the Sonoran Desert.

Bowden discussed the life that was led by the Sand Papago, by the two-village Papago, by the riverine Pima, by the Seri, the O-otam and the Apache. Each group had a different way of life, determined to a great extent by the land and weather where they lived.

"These natural flows of energy are today largely unknown and ignored. Moderns content themselves with purveying a few cactus jellies

and propelling bits of lead through the bodies of random deer..."

By the middle of the book he is ready to discuss what is happening now to the land, since the Europeans have settled the lands of the West and completely changed the way of using the earth, the plants and the animals who live here, or who used to live here. And he is not just telling the story of Arizona. He starts in the plains of Nebraska and Oklahoma and moves West with the settlers. With the beginning of the pumping of groundwater to irrigate the crop lands, Bowden moves the story across the American plains. He tunes us into progress as people change the way they view and use the land. Modern development, which has moved the Papago from an "economy based on the use of renewable resources to an economy based on the depletion of non-renewable resources" continues in the 20th Century.

The recitation of historic facts, figures and words of famous men and women are all documented with extensive notes and a complete bibliography. There are over 25 pages of historic photographs and maps. *Killing the Hidden Waters* is a book to start reading Bowden (who has written many more essays, short stories and even a novel) and to start studying the history of Arizona and Texas. It is even a good place to find some answers. Bowden complains a lot and entertains us well with his prose. But he also offers some ideas to begin solving our groundwater problems. The last chapter in the book is titled "Taking Care of Business" and he does. If you have only one evening of reading time, read this. It is amazing to read in 1991 what was written almost fifteen years ago. It still rings true.



Jane B. Cole is librarian of the Richter Library at the Desert Botanical Garden. The library is available on weekdays to Garden visitors and for phone reference at (602) 941-1225.

In Appreciation

The Desert Botanical Garden wishes to acknowledge the support of all of its 6,300 members. Recognized in the Quarterly are members of the Saguaro Society, Agave Century Club, Desert Council and donations received from July 1, 1991 through September 30, 1991.

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The DBG recognizes the Saguaro Society for its leadership and generous support of Garden programs and services.

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Memorial contributions are used to provide for the ongoing horticultural, education and research programs of the Desert Botanical Garden.

Contributions have been received in memory of:

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Irmela Domasch
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MEMORIAL TREES

Gifts through the Memorial Tree program provide horticultural maintenance of the trees on Ullman Terrace. Contributions have been received in memory of:

Edit Domasch
her daughters Ellen and Irmela
and grandchildren Dean and
Carmen

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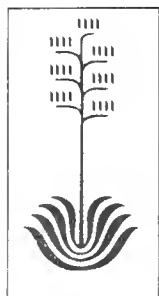
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Holiday Shopping Made Easy At the Desert Botanical Garden Gift Shop and Greenhouse

There is a convenient way to give everyone on your gift list a little bit of Arizona this season - shop at the Desert Botanical Garden! Our fabulous Gift Shop is open daily from 9 a.m. until 5 p.m. and features a variety of charming items with a Southwest flair. A gift that will give back all year is a Gift Certificate or Membership to the Desert Botanical Garden. We also have family passes - the perfect stocking stuffer! You'll also find unique items ranging from prickly pear salsa and chili pepper lights to colorful cookbooks and guides to our Sonoran Desert.

Some of the best gifts are our beautiful desert plants. The Desert Botanical Garden Sales Greenhouse sells plants in varying sizes and the Gift Shop features lovely cactus gardens that can be shipped. We also have a large assortment of Christmas Cactus, a uniquely Southwest way to decorate for the holidays. The Sales Greenhouse is open Monday-Wednesday from 10 a.m. until 2 p.m. and Thursday through Sunday from 10 a.m. until 4 p.m.



The Sonoran Quarterly
Desert Botanical Garden
1201 N. Galvin Parkway
Phoenix, AZ 85008
(602) 941-1225

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Desert Botanical Garden

Winter Calendar
1991/1992

December

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2 Birdwalk 9:00 a.m.	3 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	4 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	5 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m. Luminaria 5:30-9:30p.m.	6 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m. Luminaria 5:30-9:30p.m.	7 Luminaria 5:30-9:30p.m.
8	9 Birdwalk 9:00 a.m.	10 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	11 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	12 Miniature Basketry 9a.m.-2p.m. "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	13 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	14 Blue Corn Cookery for the Holidays 9:30-11:30a.m.
15	16 Birdwalk 9:00 a.m.	17 Celebrate the Desert: A Family Workshop 4-6p.m.	18	19	20	21
22	23 Birdwalk 9:00 a.m.	24	25 Garden is Closed	26	27	28
29	30 Birdwalk 9:00 a.m.	31				

January

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	2 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	3
5 Puppet Show 1:30-2:30p.m.	6 Birdwalk 9:00 a.m.	7 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	8 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	9 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	10 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	11 Woven Bird House 9a.m.-2p.m.
12 Puppet Show 1:30-2:30p.m.	13 Birdwalk 9:00 a.m.	14 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	15 Traditional Egg Basket 9a.m.-2p.m. "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	16 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m. Desert Foods Sampler 3:30-6:30p.m.	17 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	18 Fine Needle Basketry (pt.I) 9 a.m.-2p.m. Treasures of the Desert Family Work- shop 10-11:30a.m.
19 Puppet Show 1:30-2:30p.m.	20 Birdwalk 9:00 a.m.	21 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	22 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	23 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	24 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	25 Fine Needle Basketry (pt.II) 9a.m.-2p.m.
26	27 Birdwalk 9:00 a.m.	28 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	29 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	30 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	31 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	

February

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Living in Harmony: An Introduction to Permaculture 9a.m.-4p.m.
2 Music in the Garden 11:30 a.m. - 1 p.m. Puppet Show 1:30-2:30p.m.	3 Birdwalk 9:00 a.m.	4 "SPROUTS" 9a.m.-Noon "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	5 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	6 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	7 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	8 Pruning Desert Trees 9a.m.-Noon
9 Music in the Garden 11:30 a.m. - 1 p.m. Puppet Show 1:30-2:30p.m.	10 Birdwalk 9:00 a.m.	11 "SPROUTS" 9a.m.-Noon "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	12 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	13 Elbow Basket 9a.m.-2p.m. "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	14 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	15
16 Music in the Garden 11:30 a.m. - 1 p.m. Puppet Show 1:30-2:30p.m.	17 Birdwalk 9:00 a.m. Southwest Desert Landscaping Session A 6:30-9:30p.m.	18 "SPROUTS" 9a.m.-Noon "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	19 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	20 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m. Drip Irrigation 6:30-9:30p.m.	21 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	22 Desert Fibers and Basket Workshop-Pt.I at DBG-9a.m.-Noon
23 Music in the Garden 11:30 a.m. - 1 p.m.	24 Birdwalk 9:00 a.m. Southwest Desert Landscaping Session B 6:30-9:30p.m.	25 "SPROUTS" 9a.m.-Noon "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	26 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	27 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	28 "Touch of the Garden" 9:30a.m.-12:30p.m. Desert Garden Walks 11a.m. & 1p.m.	29 Desert Fibers and Basket Workshop-Pt.II at Heard Museum 9a.m.-Noon

Special
Events

Noche de las
Luminarias
December 5*,
6 and 7
Thursday, Friday and Saturday
5:30-9:30 p.m.
*Members Only

Join us for the Valley's favorite
holiday tradition. Seven-thousand
candles light the paths and buildings,
entertainers perform throughout the
Garden each evening and complimen-
tary cider and cookies will be served
on Ullman Terrace. There is also an
optional barbeque dinner served for
\$6 person. **Tickets must be
purchased in advance. \$8 for adults.
\$3 for children 5-12. Available at
Dillard's.**

Music in the Garden
February 2, 9, 16, 23
Sundays
Brunch served from 9 a.m. - 1 p.m.
Concert from 11:30 a.m. - 1 p.m.
Ullman Terrace

There is no better place to relax at the
end of a long week than the Desert
Botanical Garden's Sunday brunch
and concert series. Concert tickets
are \$4 each for adults and \$2 each for
children 5-12 *in addition to Garden
admission*. An optional brunch is
served for \$7 per person. Choose any
five concerts in February and March
for \$15 - a more than 25% discount off
single-ticket purchases. (Garden
admission and brunch additional).
For more information and a schedule
of performers, call (602) 941-1225.

Desert Landscaping and
Horticulture

Living in Harmony: An
Introduction to Permaculture
February 1 (Saturday)
9 a.m. - 4 p.m.
Webster Auditorium

With the continued threats to our
fragile environment, it is important to
learn how to live more in tune with
nature. This workshop in permaculture
will teach participants low-work
gardening and landscaping methods,
water harvesting strategies and other
conservation techniques for the low
desert. Instructor: Tim Murphy. Non-
members, \$35. Members, \$35. **Advance
registration required.**

Pruning Desert Trees
February 8 (Saturday)
9 a.m. - Noon
Webster Auditorium

Desert trees can provide lovely shade
canopies in addition to beautifying a
landscape, and significantly reducing
energy use. This three-hour workshop
will teach basic pruning techniques to
use on these unique and beautiful trees.
Instructor: Cesar Mazier. Non-mem-
bers, \$16. Members, \$12. **Advance
registration required.**

Southwestern Desert
Landscaping - A Practical
Environmental Approach
February 17, 24; March 2, 10, 16, 23
(Mondays except March 10)
6:30 - 9:30 p.m.
Webster Auditorium

Trail
Activities

Birds in the Garden
Mondays
9 a.m.
Meet at admissions.

Have you ever wondered what bird
was building a nest in your cactus or
tree? Or what was hovering around
your wildflowers or bushes? Discover
the birds of the desert during this one-
hour guided tour. We recommend
wearing comfortable shoes and bring-
ing your field glasses. **Free with
Garden admission.**

Touch of the Garden
Tuesdays thru Fridays except
December 17 through January 1.
9:30 a.m. - 12:30 p.m.
Along the Garden trails.

This popular program gives Garden
visitors a closer look at the plants that
make our Sonoran desert unique. Taste
prickly pear jelly, get a look at the
inside of a saguaro, feel the silky fiber
of agave or taste the sweet flour made
from the mesquite bean. **Free with
Garden admission.**

Desert Garden Walks
Tuesdays thru Fridays except
December 17 through January 1.
11 a.m. and 1 p.m.
Meet at admissions.

Join the Desert Botanical Garden
docents for this fascinating one-hour,
guided tour giving visitors a personal
look at the remarkable adaptations of
desert life. **Free with admission.**

Water is perhaps our desert's most
valuable resource and it is up to each of
us to conserve water in our landscapes.
Desert landscaping can be lush and
beautiful in addition to being water-
efficient. This comprehensive lecture
series (back by popular demand!) will
teach basic skills needed to plan and
plant a desert landscape. Participants
may register for individual sections or
the entire series. Instructor: Ron
Dinchak. Non-Members \$12 per section,
\$50 for the series. Members \$10 per
section, \$40 for the series. **Advance
registration required.**

Section A
Landscape Plan and Design
February 17 (Monday)

This section provides a good foundation
for desert landscaping focusing on
design principles, and helping partici-
pants determine the best way to achieve
their landscape goals. This section also
covers proper sequencing of landscape
installation.

Section B
Landscape Plant Materials
February 24 (Monday)

With the tremendous growth in popular-
ity of desert landscaping, there is a
staggering array of arid-land plants to
choose from. Learn about the trees,
succulents and semi-succulents that are
best suited for landscaping.

Desert Ethnobotany

Blue Corn Cookery for the
Holidays
December 14 (Saturday)
9:30 - 11:30 a.m.
Archer House

Learn how to process corn flour in the
traditional way and sample recipes for
blue-corn tamales and tortillas. Instru-
tor: Barbara Gronemann. Non-mem-
bers, \$20. Members, \$18. **Advance
registration required.**

Desert Foods Sampler
January 16 (Thursday)
3:30 - 6:30 p.m.
Webster Auditorium

Many desert plants have provided food
for humans throughout the centuries.
Learn about edible desert plants and
prepare recipes using foods collected
from the Garden. Instructor: Ruth
Greenhouse. Non-members, \$18.
Members, \$14. **Advance registration
required.**

Desert Fibers & Basket
Workshop
February 22 & 29 (Saturdays)
9 a.m. - Noon
February 22 - Desert Botanical Garden
February 29 - The Heard Museum

Some of the most beautiful artifacts
found in our museums are baskets,
mats and other works of art made with
fibers of desert plants. Participants will
learn how to make agave fiber string,
yucca fiber brushes and a small Tohono
O'odham style basket. Instructors: Ruth
Greenhouse, Bernice Monte. Non-
members, \$20. Members, \$16. **Advance
registration required.**

Section C
Landscape Plant Materials
March 2 (Monday)

This section is a great continuation of
Section B with a focus on shrubs, vines,
groundcovers and woody perennials
which can be used in desert landscap-
ing. Combined with Section B, this
section gives participants a working
knowledge of available plant material.

Section D
Special Landscape Needs
March 10 (Tuesday)

Have you always had a hard time
growing vegetables in your desert
yard? Do you cringe when you think of
soil preparation? The answers to these
and other questions will be the focus of
this section to address special
landscaping needs.

Section E
Special Landscape Features
March 16 (Monday)

Desert landscaping can be used to
enhance the area around a pool or even
to attract wildlife. This section will
examine these special needs and will
also cover conversion of a turf grass
landscape to a desert landscape.

Section F
Maintaining a Southwestern Landscape
March 23 (Monday)

Proper maintenance is critical in your
desert landscape. Learn how and when
to water and fertilize and the best ways
to control pests.

Natural Crafts

Miniature
Basketry
December 12 (Thursday)
9 a.m. - 2 p.m.
Webster
Auditorium

These tiny baskets, woven out of cane
will make lovely, personalized gifts for
the holidays. The price includes materi-
als. Instructor: Diane Wilson. Non-
members, \$22. Members, \$18. **Advance
registration required.**

Woven Bird House
January 11 (Saturday)
9 a.m. - 2 p.m.
Webster Auditorium

Lure colorful birds to the casa of their
dreams! The price include materials
Instructor: Bonnie Bogie.
Non-members, \$18. Members, \$14.
Advance registration required.

Plant Hotline
Monday-Friday
10 - 11:30 a.m.

If you have a question about a
plant or a problem with your
desert landscape, our trained
plant-hotline volunteers can
help. Call 941-1225.

Drip Irrigation
February 20 (Thursday)
6:30 - 9:30 p.m.
Webster Auditorium

In keeping with the popularity of
water-efficient landscape features, the
Garden is offering this workshop on
one of the most efficient watering
systems available - drip irrigation.
Participants will learn how to identify
various components of the system and
will learn the advantages of this water-
ing method. Instructor: Paul Spangle.
Non-members, \$12. Members, \$10.
Advance registration required.

Volunteer Opportunity

"Sprouts"
February 4 thru March 10 (Tuesdays)
9 a.m. - Noon
Webster Auditorium

"Sprouts" is a spring orientation for
prospective volunteers giving an in-
depth look at the various opportunities
for volunteering at the Desert Botanical
Garden. This orientation also features
an introduction to the Garden's educa-
tional and research mission which will
prepare the new volunteers for their
service at the Desert Botanical Garden.

Natural Crafts (cont'd)

Traditional Egg Basket

January 15 (Wednesday)
9 a.m. - 2 p.m.
Webster Auditorium

You'll wish you had your own eggs to gather with this basket made of colored reed! The price includes materials. Instructor: Bonnie Bogie. Non-members, \$18. Members, \$14. **Advance registration required.**

Pine Needle Basketry

January 18 & 25 (Saturdays)
9 a.m. - 2 p.m.
Webster Auditorium

Pine needles are the natural plant material used to make this basket which can be personalized with colorful decorations. The price includes materials. Instructor: Sharie Monsam. Non-members, \$28. Members \$24. **Advance registration required.**

Elbow Basket

February 13 (Thursday)
9 a.m. - 2 p.m.
Webster Auditorium

This v-shaped, "heart" basket is the perfect craft to celebrate Valentine's Day! All materials are included in the price. Instructor: Diane Wilson. Non-members, \$22. Members, \$18. **Advance registration required.**

Childrens Activities

Celebrate the Desert: A Family Workshop

December 17 (Tuesday)
4 - 6 p.m.
Webster Auditorium
Ages 5-11 with parent

Come to the Garden with your children after school and learn how to make imaginative holiday cards and gifts using desert plant materials. Instructors: Jean Besich and Jan Trenter. Non-members, \$10. Members, \$8. **Advance registration required.**

Treasures of the Desert: A Family Workshop

January 18 (Saturday)
10 - 11:30 a.m.
Meet at Admissions.
Ages 5-12

A secret clue map will guide parents and children on a treasure hunt where they seek out the tastes, smells, sights and sounds of the desert. Have fun and learn more about our delicate desert environment. Instructor: Barbara Gronemann. Non-members, \$12. Members, \$10. **Advance registration required.**

Puppet Shows

January 5, 12 & 19 (Sundays)
February 2, 9 & 16 (Sundays)
1:30 - 2:30 p.m.
Webster Auditorium

Created by The Great Arizona Puppet Theater to entertain and teach how animals, people and plants live in the desert. **Free with Garden Admission.**

Desert Botanical Garden Education Programs

The Desert Botanical Garden offers a great variety of education programming. Here is a brief outline of some the activities we provide for visitors, adult groups, student groups and for youngsters visiting the Garden with their families.

Touch of the Garden - provides hands-on experiences with desert plants at "Touch Carts" located along the trails. Ideal for individuals or any size group wishing to tour the Garden at their own pace. Instructors: Desert Botanical Garden Docents. The "Touch of the Garden" is offered Tuesdays through Fridays, October through May.

Desert Garden Walks - a general admission, one-hour docent guided tour through the Garden showing visitors how desert plants have adapted to survive in their environments. These tours are provided Tuesdays through Fridays during October through May.

Desert Landscaping Tours - a general admission, one-hour docent guided tour to see mature examples of the wonderful variety of plants that can be used to create beautiful landscapes. These tours are done on Saturdays during our planting months of October and March.

Birds in the Garden - a general admission, one-hour docent guided tour to acquaint visitors with local and migratory birds and their nesting habits. This tour is offered every Monday morning during the year.

Desert Detective - a free activity/game sheet which encourages each child to discover mysteries of the desert during a visit to the Garden.

Teacher aids - *The Sonoran Desert Handbook* is a Desert Study Unit providing information, introductory and follow-up lessons for classes that visit the Garden.

Puppet Shows - created by the Great Arizona Puppet Theater in cooperation with the Garden's education department to help young audiences understand how animals, people and plants depend on each other. These shows are free to schools as an outreach program with some limited availability.

Teacher In-Services - teacher and school administrator workshops focusing on the concepts of desert ecology through hands-on activities. Teachers are introduced to Garden educational opportunities and material so they can successfully design student educational experiences which supplement classroom objectives. Presentations can be tailored to meet specific needs of school programs.

Plantimal Safari - based on the Garden's *Plantimal Safari* coloring book and designed for pre-school through first grade. Students are led on a "safari" through the Garden to find the plants that look like animals using creative movement, followed by storytelling and puppet making.

Treasures of the Desert - an environmental education experience designed to foster an appreciation of the desert. Students in grades two through six use mystery maps and hidden clues to explore the desert environment. This workshop was developed by Barbara Gronemann of Southwest Learning Sources in cooperation with the Garden's education department.

Instructors Winter 1991-1992

Jean Besich is a native Arizonan with a lifelong interest in the desert and its natural materials. A retired teacher who has spent many hours working with children including children's crafts classes, Jean is a Desert Botanical Garden docent and horticulture aide.

Bonnie Bogie is a fiber artist with a flair for color and texture. She has taught classes in Canada, Arizona and California and her work can be found in galleries in all those places. She is advisor to the Desert Art Studio, a member of VAA and creator/designer of the Gypsy Flower collection which is now being marketed throughout the country.

Desert Botanical Garden Volunteers are extensively trained in desert ecology and have also had vast experience in educational interpretation and horticulture.

Ron Dinchak is the author of *An Illustrated Guide to Landscape Shrubs of Southern Arizona* and *An Illustrated Guide to Landscape Trees of Southern Arizona*. He is currently a professor of environmental biology at Mesa Community College. A popular Valley instructor and landscape consultant, he has been teaching classes at the Desert Botanical Garden for over 11 years.

Yarm Falater is the current president of Basket Artisans of Arizona, a basketry guild. She enjoys making all types of baskets and has been teaching basketry since 1985.

The Great Arizona Puppet Theater was co-founded by professional puppeteers Nancy Smith and Ken Bonar and incorporated in 1983 as a touring theater in Arizona. The company's permanent downtown Firehouse Theater opened in 1988 featuring weekend performances of traditional and Arizona heritage stories.

Ruth Greenhouse is the Exhibits Coordinator at the Desert Botanical Garden. She was project director for the *Plants and People of the Sonoran Desert* exhibit trail and has been teaching ethnobotany classes at the Garden since 1981.

Barbara Gronemann is a curriculum specialist on the Southwest with a Master's Degree in education from Columbia University. She is a certified teacher and former museum educator at Pueblo Grande Museum. She is the director of Southwest Learning Sources.

Cesar Mazier, superintendent of horticulture at the Desert Botanical Garden holds a Bachelor of Science Degree in agriculture from the University of Honduras and a Master's in agriculture from New Mexico State University.

Sharie Monsam was the 1988 Artist of the Year for the City of Mesa and has been teaching fiber art classes for 16 years in the Valley and at the Garden since 1985. Chosen to represent Arizona in Canadian fiber art shows in 1986, she has also participated in shows in California and New Mexico.

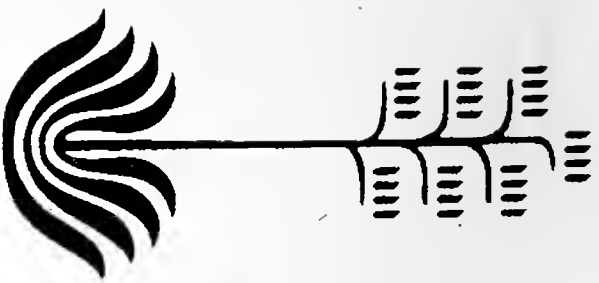
Bernice Monte is a Tohono O'odham whose family members are all basket makers. She is currently teaching her daughter traditional basketweaving.

Tim Murphy is an experienced permaculture consultant who specializes in the development of water harvesting systems and edible landscapes in arid regions. His designs have been commissioned by Pima Community College in Tucson, San Xavier District of the Tohono O'odham Nation as well as numerous private individuals.

Paul Spangle is Spangle from the National Park Service and lives in Santa Fe, New Mexico where he began designing and installing drip irrigation systems. He has conducted many drip irrigation workshops at the Desert Botanical Garden and the Transition Zone Horticultural Institute in Flagstaff.

Jan Trenter is a Desert Botanical Garden docent who has taught children's craft classes and flower pressing workshops at the Garden for four years. She is a working artist in stained glass where wildflowers are incorporated into her work.

Diane Wilson has been a basketry instructor at the Desert Botanical Garden since 1978. She has studied basketry in California, Illinois and Arizona. A past president of the Arizona Weavers and Spinners Guild, her baskets are displayed and sold at the Craftsman's Cooperative Gallery.



Desert Botanical Garden

1201 N. Galvin Parkway
Phoenix, AZ 85008
(602) 941-1225

Garden Hours:

The Garden is open every day of the year, including holidays (except Christmas Day).

June-August-8a.m.-Sunset
Sept.-May-9a.m.-Sunset
Gift Shop Hours-9a.m.-5p.m.
Sales Greenhouse

10a.m.-2p.m.
(Monday-Wednesday)
10a.m.-4p.m.
(Thursday-Sunday)

Admission:

Adults \$4.00
Seniors \$3.50
Children 5-12 \$1.00
Children under 5 Free
Members Free

Membership Application

Become a Member today! If you're not already a member or if you know someone who would enjoy Garden membership as a gift, consider all the benefits of joining: unlimited free admission for one year; guest passes for family or friends; a subscription to all our publications, including this calendar; invitation to preview events; discounts on classes and at the Garden Gift Shop and Greenhouse.

☐ Yes! I want to enjoy the benefits of Garden Membership.

Category of Membership I have selected:

- ☐ \$30 - *Individual* - All benefits PLUS 4 guest passes
☐ \$40 - *Family* - All benefits PLUS 8 guest passes
☐ \$60 - *Contributing* - All benefits PLUS 10 guest passes
☐ \$125 - *Saguaro Society Club* - All benefits PLUS 12 guest passes, invitation to special Century Club events, recognition in Garden publications.
- ☐ \$1,000 - *Saguaro Society* - All benefits PLUS unlimited guest privileges, invitation to Saguaro Society events and recognition in Garden publications.

Name _____

Payment enclosed \$ _____

Please bill my: ☐ Visa ☐ MasterCard

Address _____

Card Number _____

Phone _____

Expiration Date _____

Registration Form

You may register in person, by mail or by phone, using MasterCard or Visa, at 941-1225. Class sizes are limited so we regret that receipt of your check does not guarantee enrollment. Your enrollment will be confirmed by mail and if the class is not available, your check will be returned to you. Send this form to the Garden at 1201 N. Galvin Parkway, Phoenix, AZ 85008.

Activity _____

Fee (Member)

Fee (Non-member)

\$

\$

\$

\$

\$

\$

Total

Name _____

Payment enclosed \$ _____

Please bill my: ☐ Visa ☐ MasterCard

Address _____

Card Number _____

Phone _____

Expiration Date _____